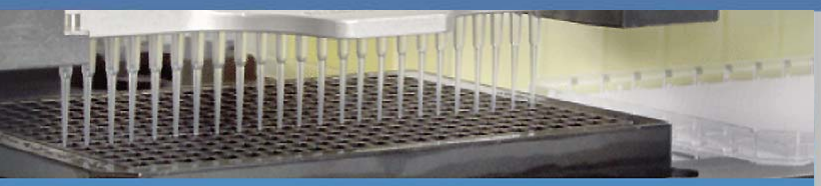

MATRIX®
ControlMate Software

Thermo SCIENTIFIC

Thermo Scientific

Versette™ ControlMate®

User Manual

110762 Revision B 18 Oct. 2012

TRADEMARKS

DISCLAIMER

Revised Oct. 2012

For Research Use Only. Not for use in diagnostic procedures.

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About this User Manual

The ***Thermo Scientific Versette***™ system is a versatile automated microplate and tube pipetting system designed to meet the demands of life science/research liquid manipulation at all stages and rates of production. This guide describes the installation setup, operation, and routine use of the ControlMate software for ***Versette***. Refer to the ***Versette User Manual*** for complete details on the installation and operation of the ***Versette*** system.

Intended use

The ***Versette*** system is intended for professional research use by trained personnel. The instrument is intended for automated microplate and tube pipetting. Use for diagnostic testing is excluded. It is recommended that Good Laboratory Practice (GLP) is followed to guarantee reliable analyses.

Intended users

This user manual is written for the end user, for example, research scientist or laboratory technician, and provides information on the use of ControlMate software for the ***Versette*** system. The ***Versette*** system is intended for use by persons who have been trained on standard laboratory and equipment safety and use.

Read this manual in its entirety before operating the instrument.

How to use this user's manual

This user manual is designed to give you the information to:

- Install the ControlMate software
- Calibrate the ***Versette*** system
- Understanding the Eprompts/Icons
- Perform sample sequences
- Optimize the instrument performance

Related Documentation

In addition to this guide, Thermo Scientific provides the following documents for the ***Versette*** system:

- *Versette User Manual*

Contacting Us

For the latest information on products and services, visit our website at:
http://www.thermoscientific.com

Safety and Special Notices

Make sure you follow the precautionary statements presented in this guide and in the *Versette User Manual*. The safety and other special notices appear in boxes. Thermo Fisher Scientific and any of its agents, affiliates, subsidiaries, or other relations, direct or casual, will not be held responsible for a user's failure to comply with safety devices and practices.

Safety and special notices include the following:

CAUTION Highlights hazards to humans, property, or the environment. Each CAUTION notice is accompanied by an appropriate CAUTION symbol.

IMPORTANT Highlights information necessary to prevent damage to software, loss of data, or invalid test results; or might contain information that is critical for optimal performance of the system.

Note! Highlights information of general interest.

Tip Highlights helpful information that can make a task easier.

Safety symbols and markings

These symbols are intended to draw your attention to particularly important information and alert you to the presence of hazards as indicated.

Safety symbols and markings used on the Versette

The following symbols and markings appear on the type label and the instrument itself.

Power ON ▲

Power OFF ▲

Serial number ▲

Cat. number ▲

Date of manufacture ▲

Consult instructions for use ▲

WEEE symbol This product is required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC. ▲

Warning and other markings used in the documentation

Symbols and markings appearing in the user manuals may include the following:

CAUTION Symbol	CAUTION
	**Electric Shock:** This instrument uses high voltages that can cause personal injury. Before servicing, shut down the instrument and disconnect the instrument from line power. Keep the top cover on while operating the instrument. Do not remove protective covers from PCBs.
	**Chemical:** This instrument might contain hazardous chemicals. Wear gloves when handling toxic, carcinogenic, mutagenic, or corrosive or irritant chemicals. Use approved containers and proper procedures to dispose waste oil.
	**Heat:** Before servicing the instrument, allow any heated components to cool.
	**Fire:** Use care when operating the system in the presence of flammable gases.
	**Eye Hazard:** Eye injury could occur from splattered chemicals or flying particles. Wear safety glasses when handling chemicals or servicing the instrument.
	**General Hazard:** A hazard is present that is not included in the above categories. Also, this symbol appears on the instrument to refer the user to instructions in this manual.

CAUTION Symbol	CAUTION
	**Pinch Hazard:** Moving parts can injure hands and/or other body parts. Use extreme care. Do not reach into an operating system. Always keep covers in place. Lift objects with care.

When the safety of a procedure is questionable, contact your local Technical Support organization for Thermo Scientific Products.

General Warnings

- Follow all warnings and cautions in this manual and in the *Versette User's Manual*.
- Use of the ***Versette*** system in ways other than those described in the documentation supplied with the equipment may result in injury to persons or damage to the property. Avoid unintended use of the equipment, for example, using incompatible materials, making unauthorized modifications, using incompatible or damaged parts, using unapproved auxiliary equipment or accessories, or operating equipment in excess of maximum ratings.
- The ***Versette*** system is to be used only as offered, for the purposes described in the User Manuals, in accordance with standard industry safety practices, and common safety usage. This equipment is not intended for any other usage other than that described. Use of this equipment in any other application or manner, without the direct written consent of Thermo Scientific may constitute an unsafe practice, and will void all warranty on the part of the manufacturer.

Introduction

General Description

Thermo Scientific ***ControlMate*** is a Windows®-based application that provides a graphical user interface for creating and running pipetting programs. From this application you can create and run a variety of pipetting operations, from repetitive liquid transfers to complex pipetting sequences.

Because the ***ControlMate*** software is tightly integrated with the ***Thermo Scientific Versette*** system, you can control all ***Versette***™ functions from the software, such as changing tips and pipette heads, or fine-tuning plate movements to handle delicate pipetting operations.

Installation

ControlMate installation follows a standard Windows software installation process. Simply double-click the ControlMate executable file and follow the system prompts. This process is detailed on the following pages.

We recommend that you install the ControlMate software and read this entire manual prior to attempting to work with the ***Versette*** system.

After installation, familiarize yourself with the ControlMate screen, menus, and commands, as detailed in the appropriate sections of this manual. Refer to the Calibration section of this manual to calibrate the ***Versette*** coordinate system before attempting to run a program on a newly installed system. See "Calibrating the System Coordinates" on page 49.

Minimum System Requirements

To ensure successful operation, hibernation and sleep mode on the laptop/computer needs to be disabled prior to installing **ControlMate** and subsequent running of protocols. Refer to the following pages for details.

Computer minimum requirements:

- Computer running Microsoft® Windows XP sp3 or Windows 7 (32- and 64-bit)
- Screen resolution set to at least 1024 x 768
- CD-ROM, removable drive, or network drive for access to installation software

Computer interface requirements:

RS-232 Serial connector cable no longer than 3 meters

Note! To ensure proper communications with a laptop or other computer, do not use an RS232 cable longer than 3 meters when connecting the computer to the system.▲

Serial connector details:

- Serial RS-232C
- 115,200 bps

- 8 data bits
- 1 stop bits
- Parity: none

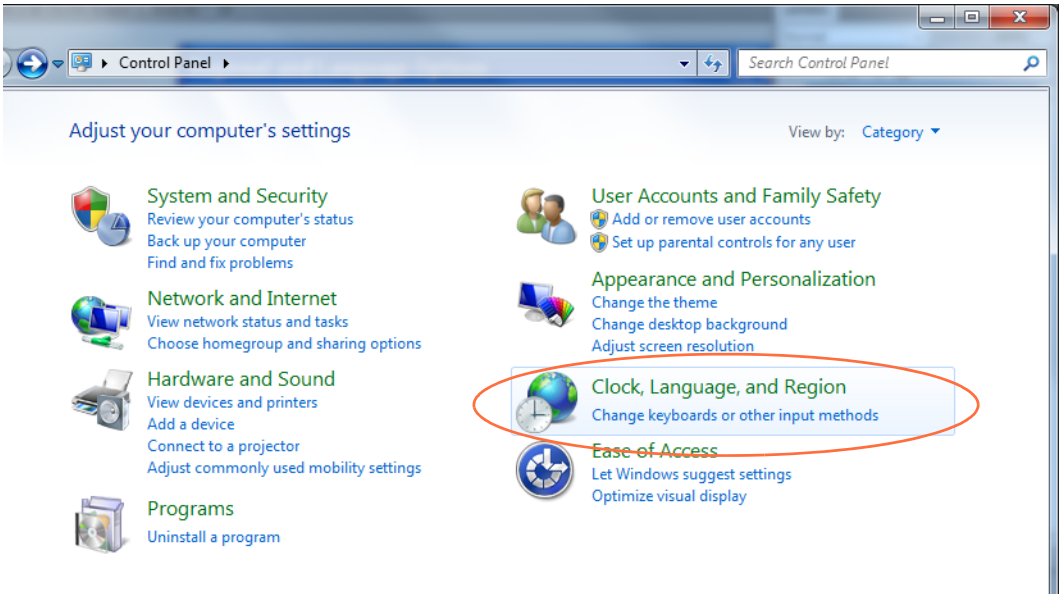
If no RS-232 connection is available on the computer, a commercially available USB/Serial adapter may be used. Consult with your local computer specialist for compatibility and connectivity issues and requirements. Thermo recommends the Keyspan Hi-Speed USB Serial Adapter number USA-19HS, available from CDW as part number 555201 with UNSPC 43201408. This is a 9-pin D-Sub (DB-9) to 4-pin USB Type A adapter, serial connectivity technology with RS-232 data transfer rate of 230 Kbps, or equivalent. Please note that not all adapters will work with the ***Versette*** system

English Language Requirements

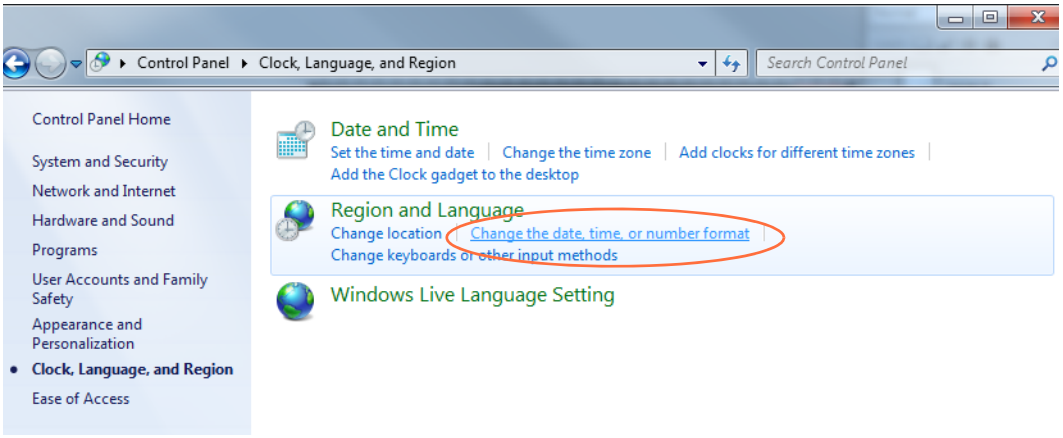
The Versette system uses English conventions for all numerical entries. For example, 1000 is entered as 1,000 and 1400 is entered as 1,400. For some regions or computers where English is not the default language, the computer's Regional Settings must be set to English to properly operate with ControlMate:

1. From the Windows Start Menu, select "**Control Panel**".
2. Select "**Regional and Language Options**" (Windows® XP), or "**Clock, Language and Region**" (Windows 7).

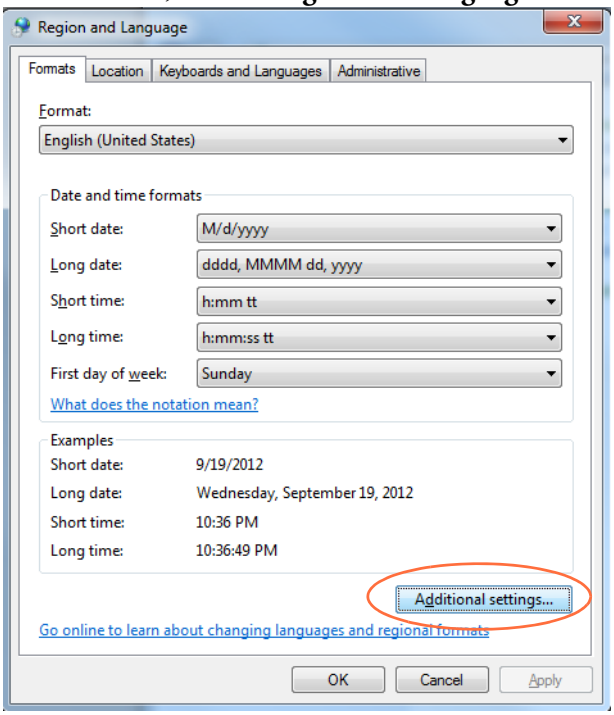
   Note! The following instructions show Windows 7 screens. Similar screens are available for Windows XP. Consult your computer documentation for any variations/details as the menu selections can change.



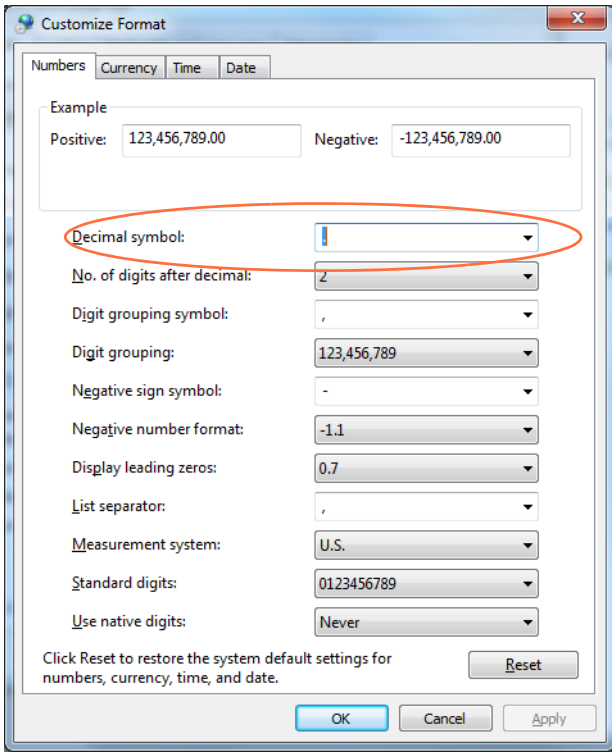
3. For Windows 7, under "**Region and Language**", select "**Change the date, time, or number format**".



4. In Windows 7, on the "**Region and Language**" screen, click "**Additional settings...**".



5. Change decimal symbol from comma (,) to decimal (.).



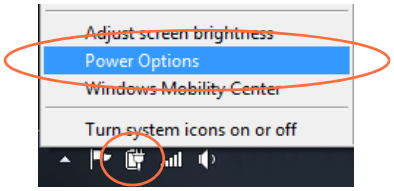
6. Click "**Apply**", then "**OK**" to close the window.

Installing ControlMate

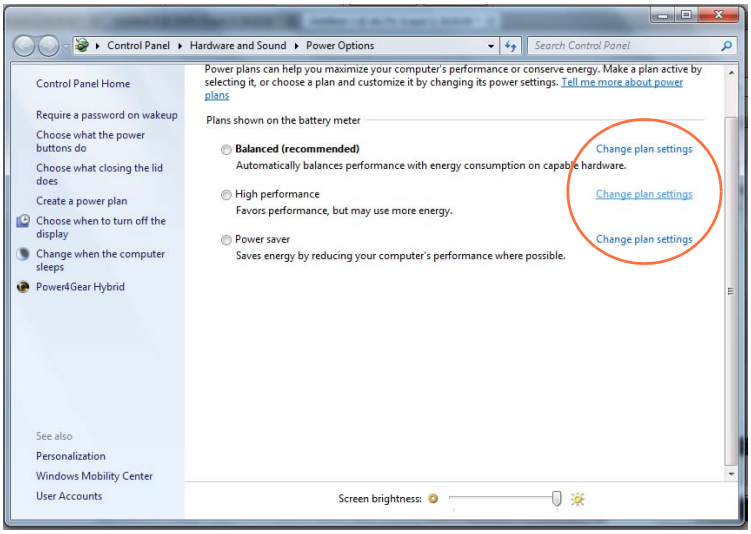
The ControlMate software can be used from a CD, a flash drive, or installed from a common directory or server. The software can be downloaded from http://controlmate.net/.

1. Disable hibernation and sleep mode on the laptop/computer prior to installing **ControlMate** and subsequent running of protocols.
   Refer to your computer's documentation on power mode options for instructions. Typically these settings are available by right or left clicking on the power icon on the toolbar, then selecting a power option and disabling hibernation and sleep mode. An example set of screws for Windows 7 is shown in the following steps:

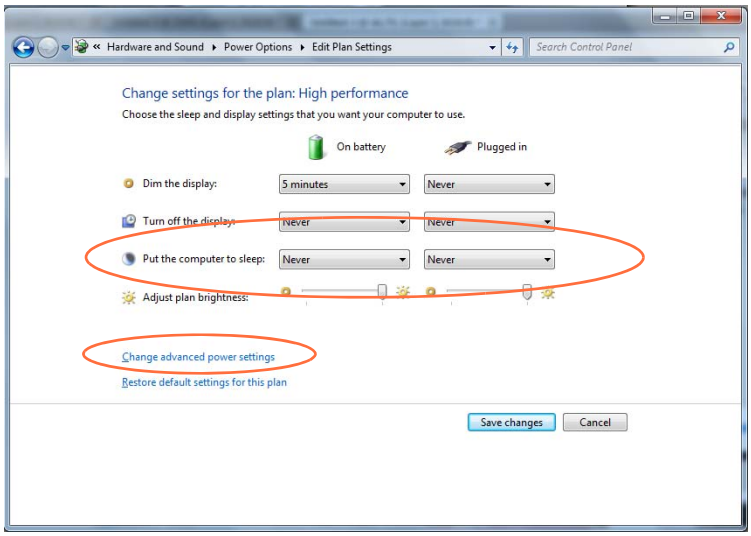
   a. Right or left click on the power icon then elect "**Power Options**". Alternatively, select Power Options through Windows Control Panel.



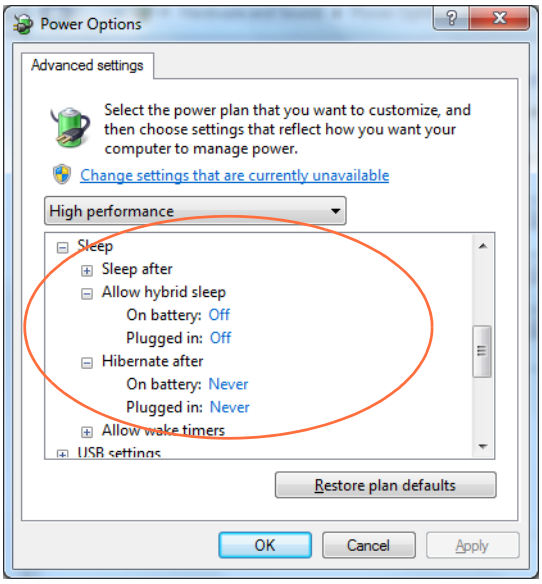
b. Select "**Change plan settings**" for your selected power plan.



c. Set sleep to "**Never**", then select "**Change advanced power settings.**"

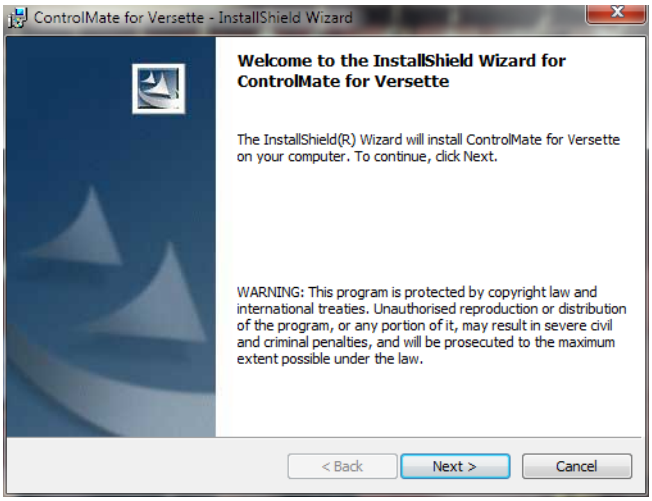


d. On the "**Advanced settings**" screen, expand the "**Sleep**" setting then set all sleep and hibernations to "**Never**". Click "**Apply**" then "**OK**" to save the changes.

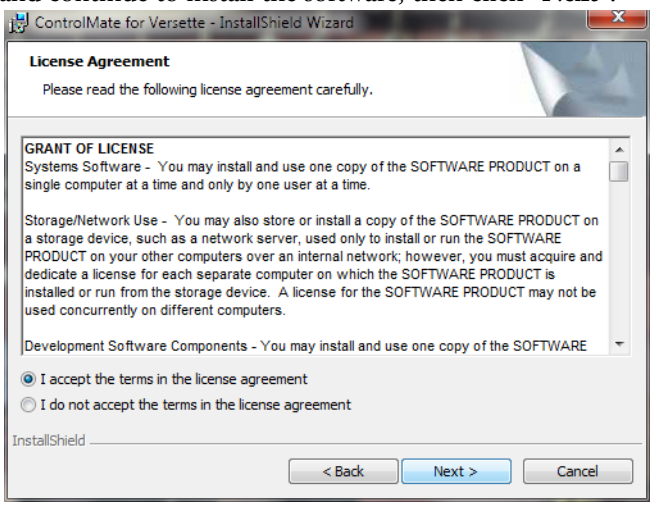


2. Locate the **setup.exe** file on your hard drive, flash drive, common drive, network, or CD, then double-click on the **setup.exe** file to launch the installation program.

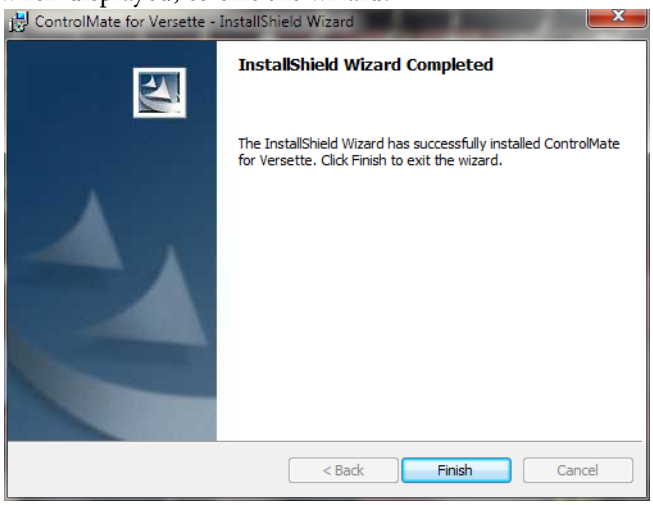
3. At the InstallShield Wizard, click "**Next**."



4. Read the License Agreement, select "I accept the terms in the license agreement" to agree and continue to install the software, then click "**Next**".



5. Wait for the ControlMate files to copy to your installation directory, then select "**Finish**" when displayed, to exit the wizard.



Configuring ControlMate

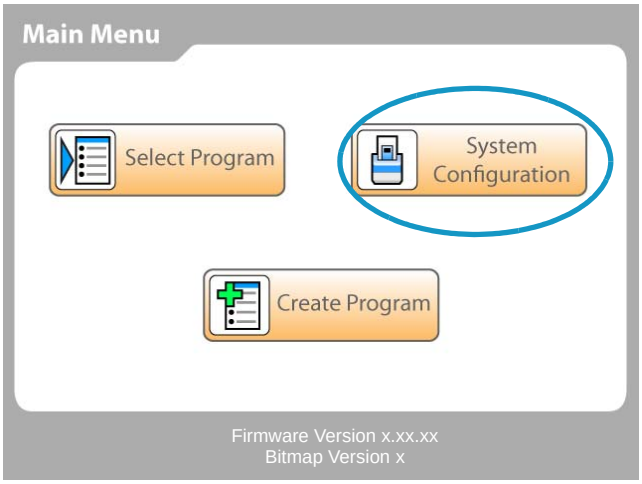
The ***Versette*** system is designed for easy operation via an on-board wizard-based touchscreen menu system and via the ControlMate PC-based software. This section details the steps necessary to connect a PC running ControlMate to a ***Versette*** system.

Connecting to a Versette System

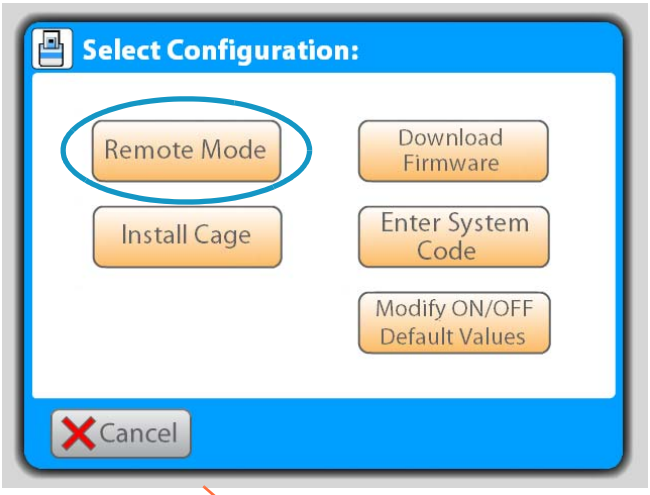
Before using the ControlMate software to run sequences, you must first configure ControlMate to work with your ***Versette*** system.

1. Connect a computer with ControlMate software installed to the ***Versette*** system according to the instructions provided in the *Versette User Manual*.
2. Start ControlMate by clicking "**Start**" in the Windows Taskbar and selecting ControlMate from the Programs menu, or double-clicking a ControlMate desktop icon shortcut.
3. Using the onboard Graphical User Interface (GUI) on the ***Versette*** system, select 

from the Main Menu.

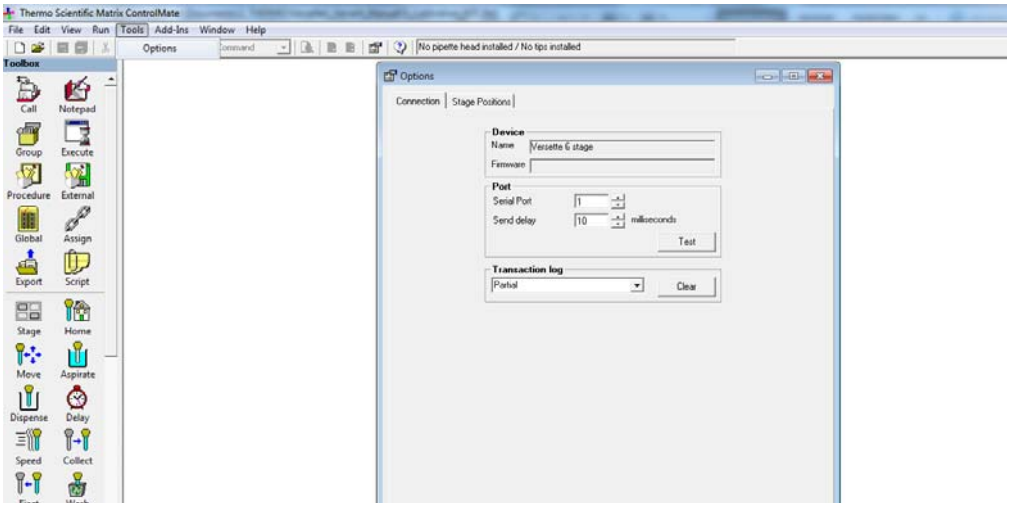


4. Select Remote Mode to set the system to remote operation.

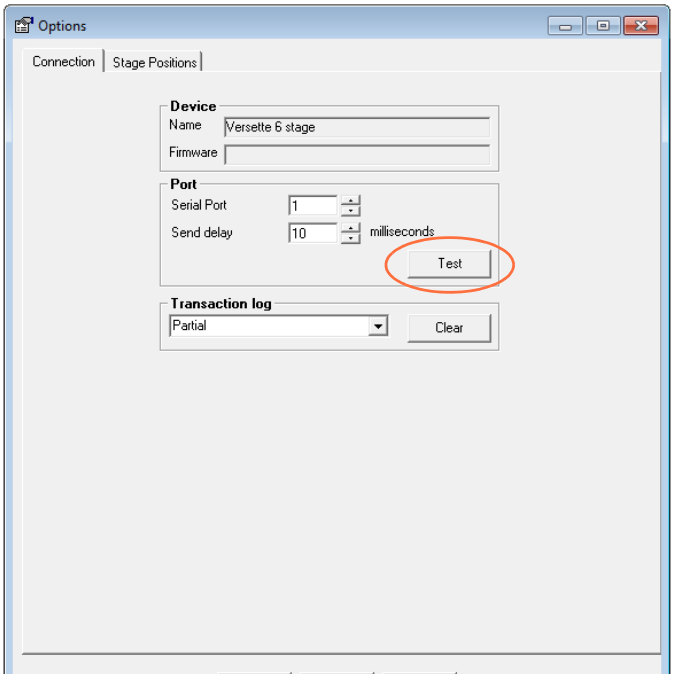


System operating in remote control mode

5. Using the ControlMate software, click on the Tools menu and select Options.



6. The system defaults to Serial Port 1. If necessary, use the arrow keys to select the Serial Port (RS232 or RS232 Virtual Serial Communication port) for you computer connection, then click the **"Test**" button.



7. Verify that the Device Connection is OK.
   Always check your serial cable connections if there is a communication problem.

Note! If you are unable to connect, verify that your computer is recognizing the port that the communication cable is attached to on your computer. You do this through Device Manager. In Windows, select Start then Control Panel, then Hardware and Sound (on Windows 7 systems), then Device Manager. The screen should display the port as shown below:

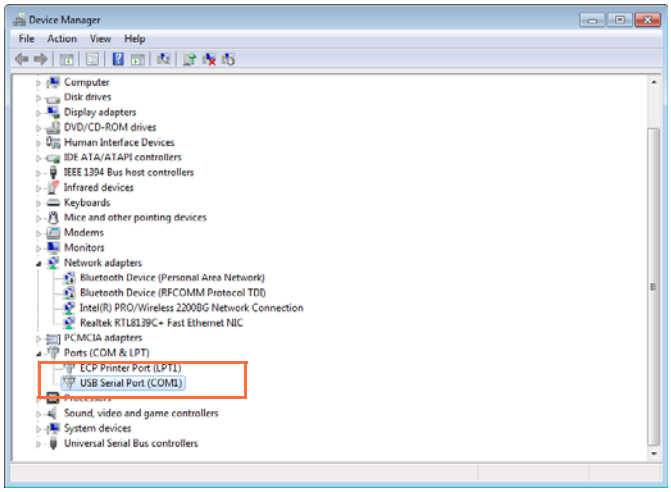
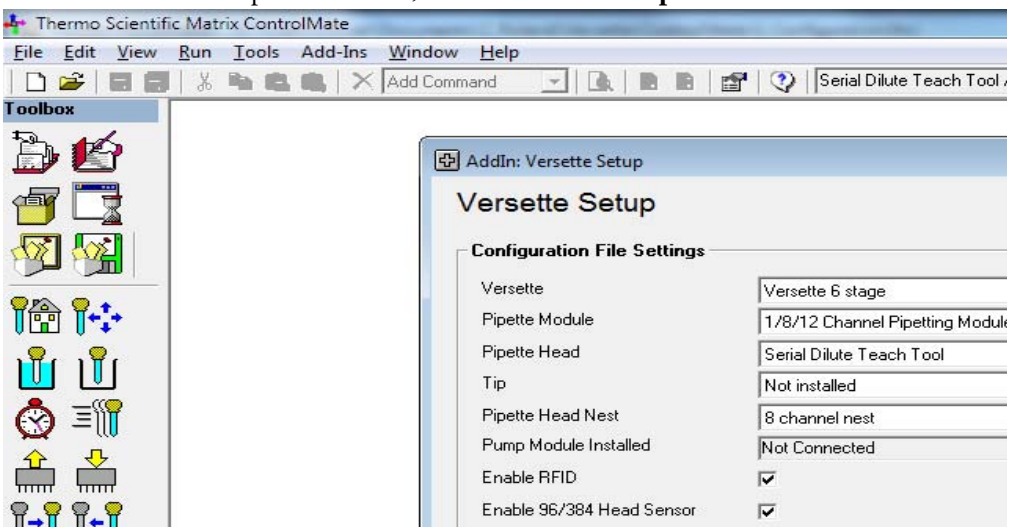


Table 1. Connection Screen

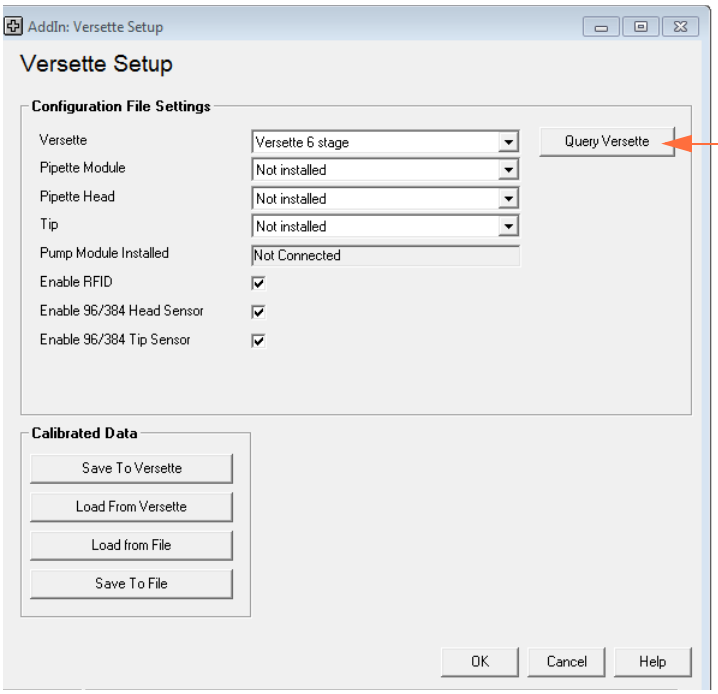
Item	Description
Device Name	Displays the name of the ***Versette*** system, based on the system's configuration.
Device Firmware	Displays the currently installed firmware on the ***Versette*** system.
Serial Port	Use this field to set the serial communication port number available on the controlling PC. Range values are from 1 to 256; however, the most common value for most systems is 1.
Send Delay	Use this to change the delay between commands issued to the ***Versette*** system. Default is typically 100 milliseconds and usually does not need to be changed. The lower the value the faster the response to query type commands. However, too low a value may cause the response sent from the ***Versette*** system to be lost. If the ***Versette*** is situated in a noisy electrical environment (near unshielded cables, for example) or in a location that is not close to the PC, then increasing this value would provide a better means of eliminating electrical noise and interference that may exist on the serial interface cable.
Transaction Log	Checking this box will cause all commands issued via the serial port to be logged into a file (PortLog.txt) which can be found in the application program file directory. To clear the file, click the Clear button. This feature is useful to troubleshoot problems. However, as the log continues to grow in size, you may wish to periodically backup or otherwise remove the file from your hard drive.

Verify Versette System Setup

1. From the **Add-ins** drop-down menu, select "**Versette Setup**".



2. Click the "**Query Versette"** button to confirm machine and ControlMate are properly communicating. Drop-down fields will automatically prefill with the appropriate information.
   You can also make any changes to the Configuration File Settings by selecting the correct system configurations from the drop-down menus. Check marks should be placed next to all optional equipment as shown below (even if not installed, as it will not affect performance). A check mark should be placed next to the RFID at all times during calibration and normal system operation. This feature is only turned off during manufacture or field service troubleshooting activities. When finished, click "**OK"**.



Click to populate fields with info from Versette system

Calibration

Calibrating the System Coordinates

Purpose/summary

All systems are calibrated at the time of manufacture. Due to the precise nature of the equipment's motions, the "coordinate calibration" needs to be verified, and minor adjustments are typically required, upon installation. Calibration consists of placing a "teach tool" in the system and moving the system stage locations and pipetting module to pre-defined coordinates. Minor adjustments to the precise calibration locations help to ensure precise and consistent aspiration and dispense.

When to calibrate the system

The ***Versette's*** coordinate system should be calibrated upon installation and re-checked whenever the system is moved. The coordinate system can also be verified and/or adjusted at periodic intervals as determined by the usage and end-user.

Coordinate system

The coordinates used on the ***Versette*** system are standard geometric coordinates:

- X-axis: left-to-right position
- Y-axis: front-to-back position
- Z-axis: up and down (height) position

Skill level

Coordinate calibration is typically performed by a trained professional but can be performed by most technicians who understand how to use the ControlMate software, are familiar and comfortable with working on precision equipment and with working with Windows-based software, and who understand basic X-axis (left-to-right), Y-axis (forward-to-back), and Z-axis (vertical) coordinates. The coordinate system is referenced from the front of the machine where the operator stands.

Versette System Calibration Flowchart

All calibration steps require the use of the Calibration Plate. The methods are shown below:

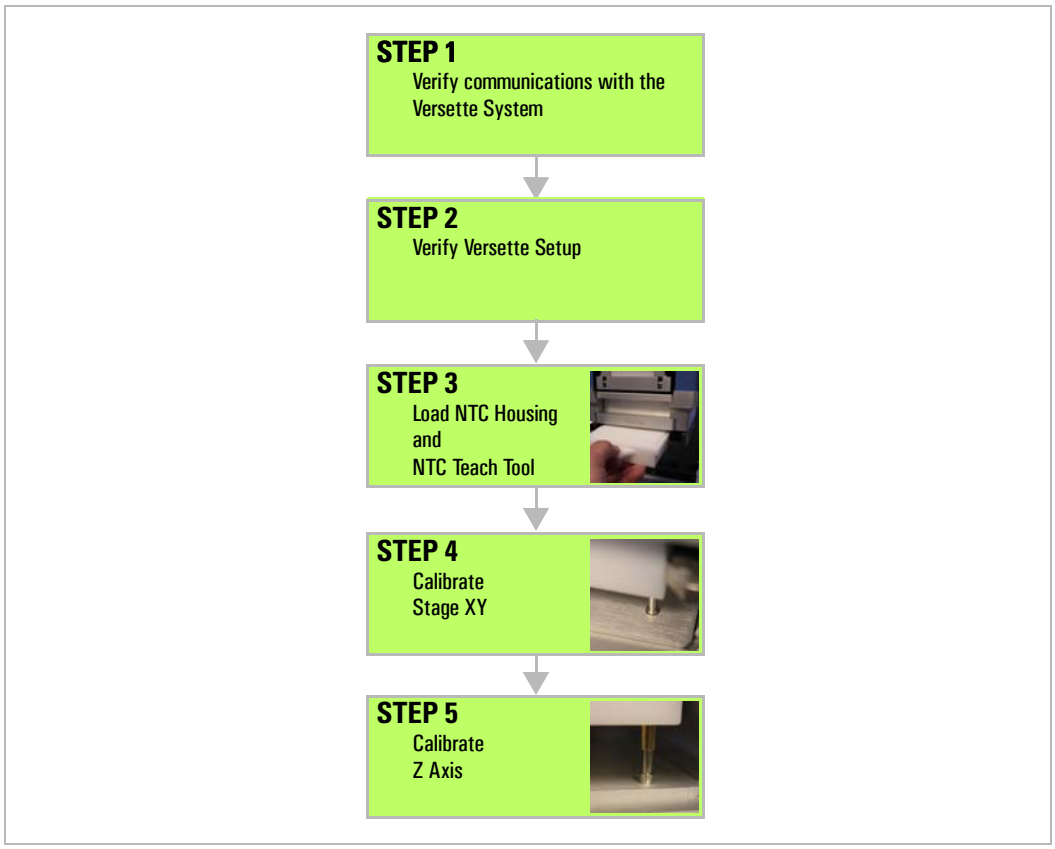


Figure 1. Versette Calibration Master Flowchart

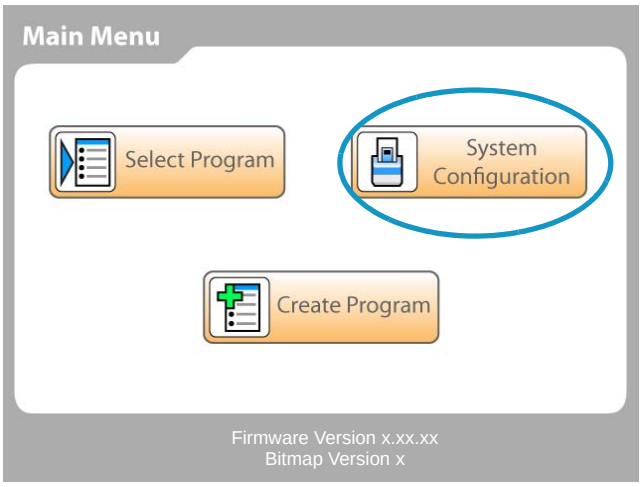
Required Equipment

- ***Versette*** system with 6-stage assembly
- ControlMate software, installed on computer or laptop with communications cable
- Calibration Plate
- NTC Teach Tool

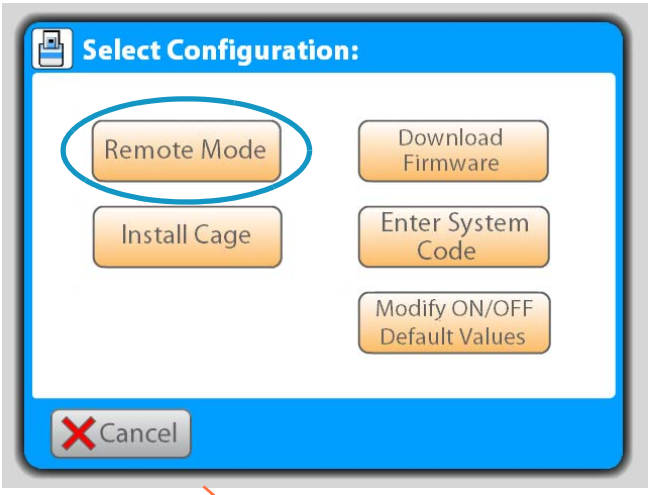
STEP 1: Verify Communications with the Versette System

1. Verify that the stage assembly has been installed properly on the system. See Installation section.
2. Connect the ***Versette*** to a computer running ControlMate software. Refer to the ***ControlMate User Manual*** for details on setting "View" options including icon size and text displays.
3. Select 

from the Main Menu.

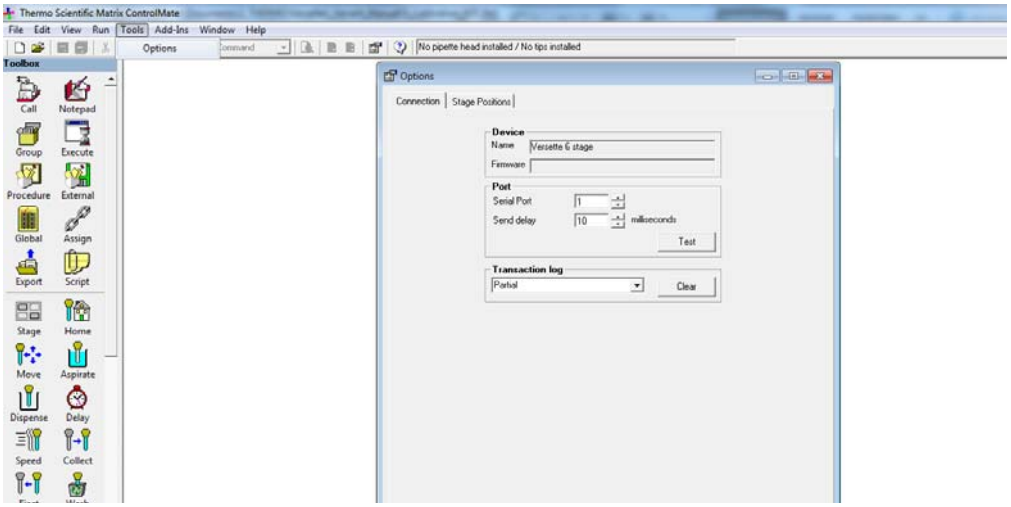


4. Select Remote Mode to set the system to remote operation.

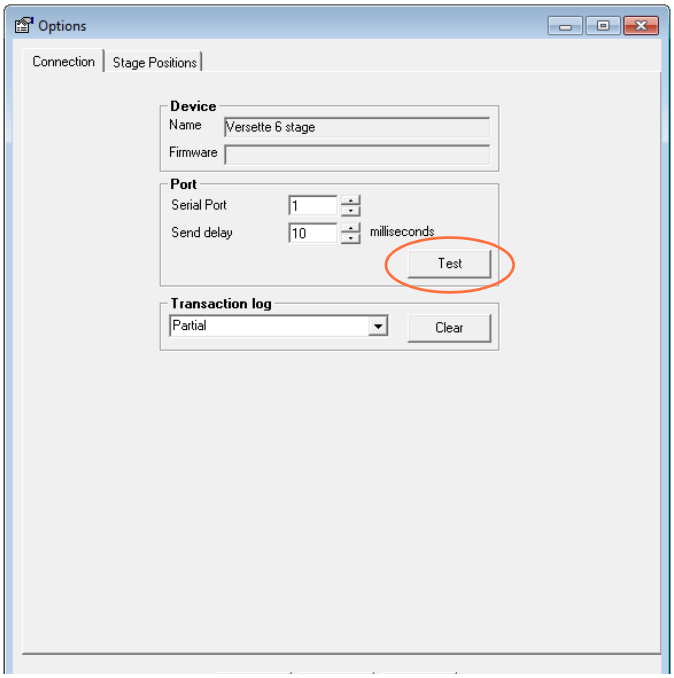


System operating in remote control mode

5. Using the ControlMate software, click on the Tools menu and select "**Options**".

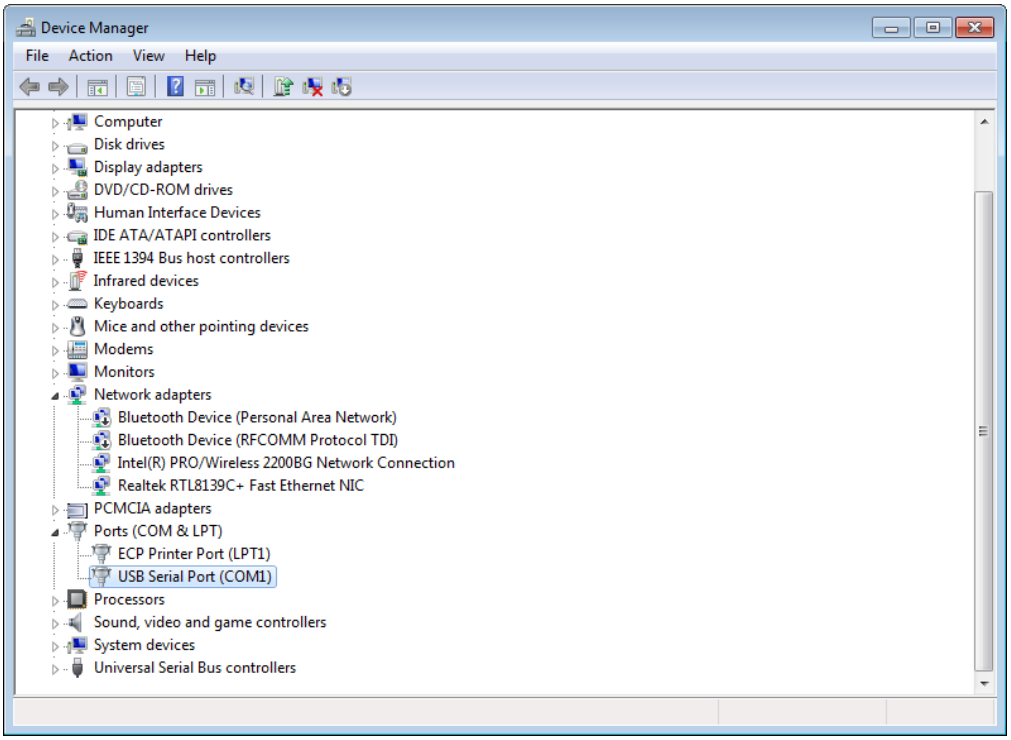


6. Click the **"Test**" button.



7. Verify that the Device Connection is OK.
   The system defaults to Serial Port 1. If necessary, use the arrow keys to select the Serial Port (RS232 or RS232 Virtual Serial Communication port) for you computer connection and re-test. Always check your serial cable connections if there is a communication problem.

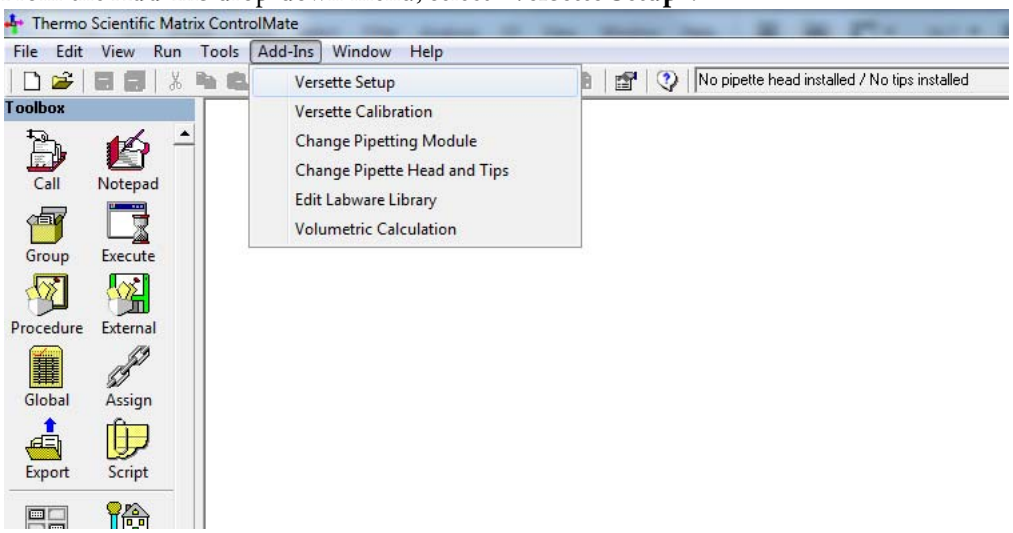
   Note! If you are unable to connect, verify that your computer is recognizing the port that the communication cable is attached to on your computer. You do this through Device Manager. In Windows, select Start then Control Panel, then Hardware and Sound (on Windows 7 systems), then Device Manager. The screen should display the port as shown below:



8. Click on the "**Test**" button to verify that the Device Connection is OK.

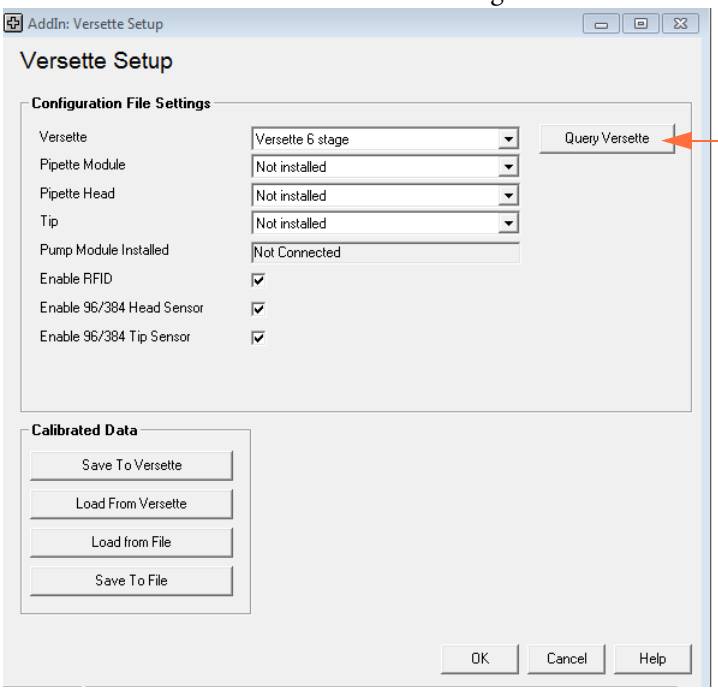
STEP 2: Verify Versette System Setup

1. From the **Add-Ins** drop-down menu, select "**Versette Setup**".



2. Click the "**Query Versette"** button to confirm machine and ControlMate are properly communicating. Drop-down fields will automatically prefill with the appropriate information.

   You can also make any changes to the Configuration File Settings by selecting the correct system configurations from the drop-down menus. Check marks should be placed next to all optional equipment as shown below (even if not installed, as it will not affect performance). A check mark should be placed next to the RFID at all times during calibration and normal system operation. This feature is only turned off during manufacture or field service troubleshooting activities. When finished, click "**OK"**.

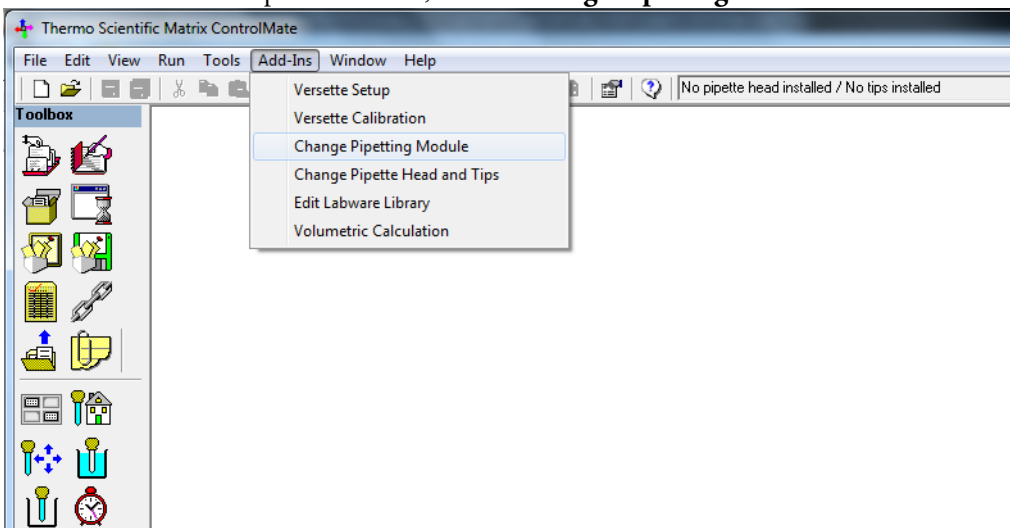


Click to populate fields with info from Versette system.

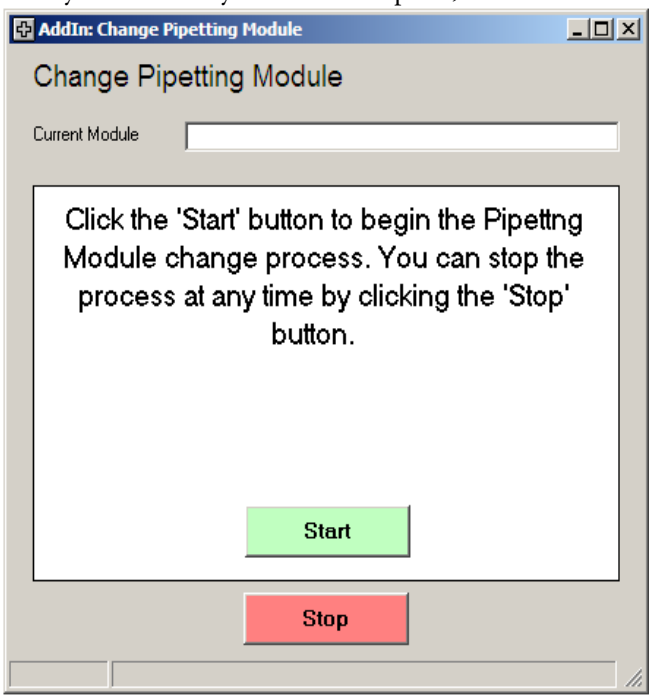
STEP 3: Install the NTC Pipetting Module and NTC Teach Tool

If not installed, install an NTC Pipetting Module as follows:

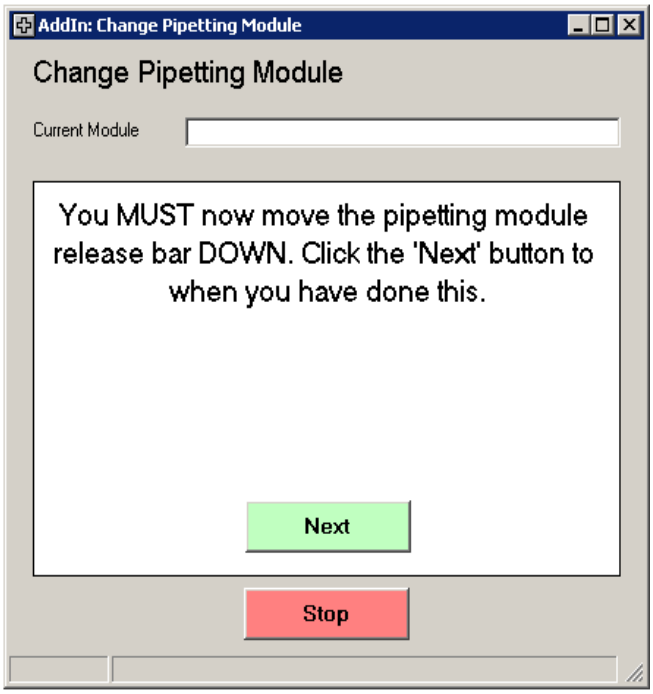
1. From the **Add-Ins** drop-down menu, select "**Change Pipetting Module**".



2. Follow the screen prompts to install an NTC pipetting module:
   a. Verify that all safety shields are in place, then click "**Start**".

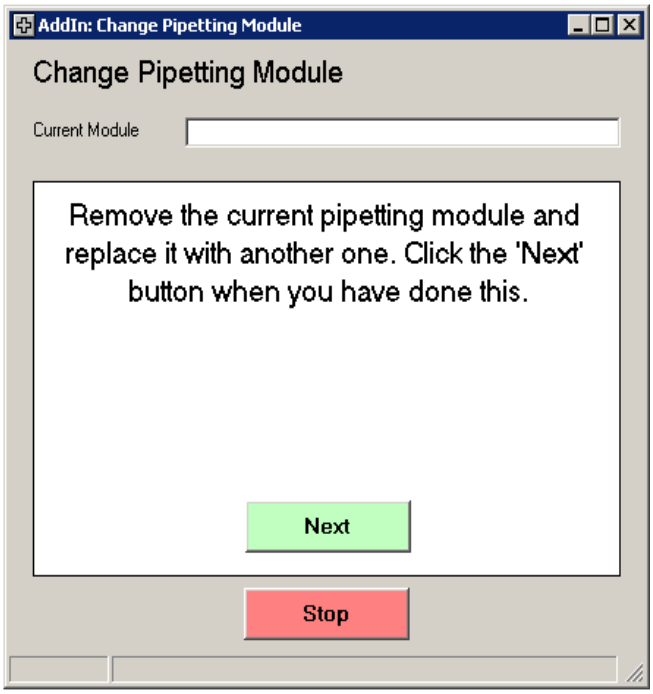


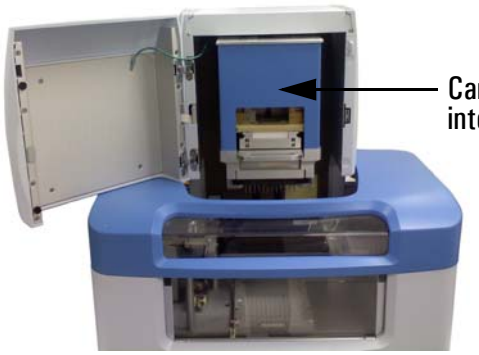
b. Move the release bar DOWN then click "**Next**".



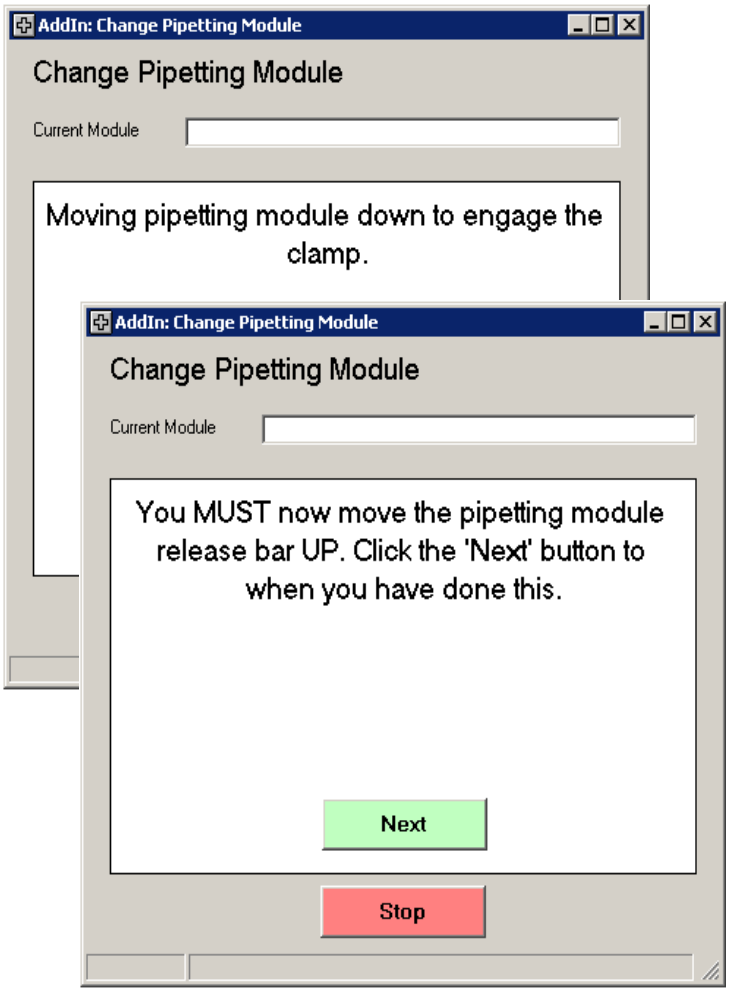
Rotate Release Bar to DOWN position.

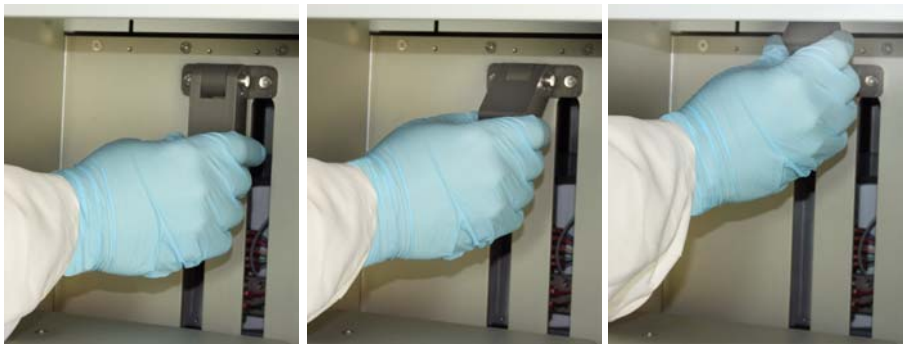
c. Carefully lift and position the pipetting module onto the pipetting module holder then click "**Next**".





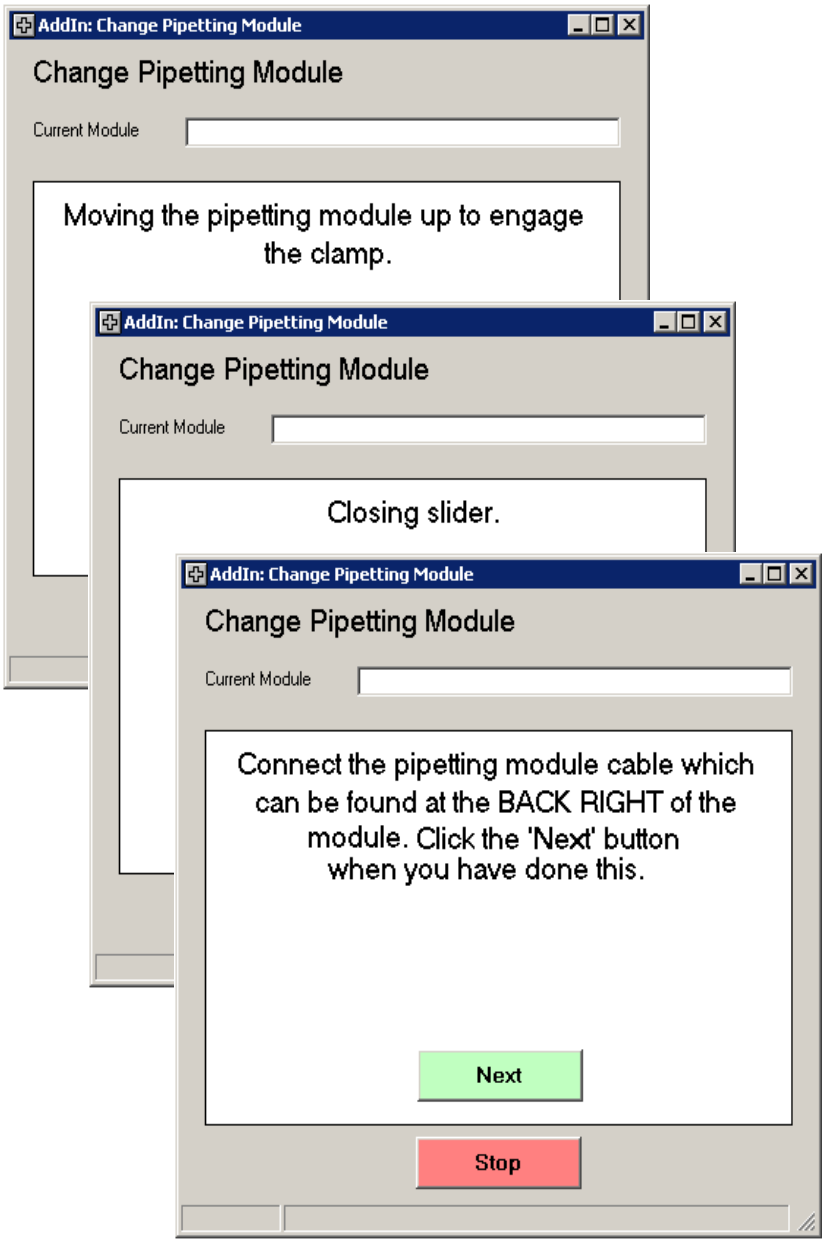
d. Wait for the system prompt, then move the release bar UP, then click "**Next**."





Rotate Release Bar to UP position.

e. Wait for the system prompt then connect the pipetting module cable, then click "**Next**".

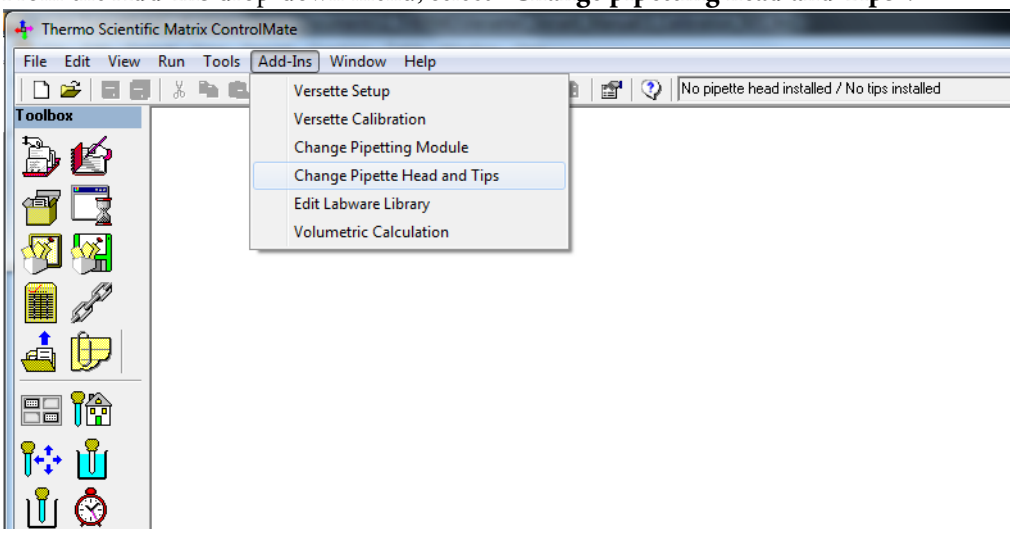


The cable connector may have red dots which align to the system connector. The dots are difficult to see due to their location. Follow the screen messages carefully and press in firmly to ensure proper connection.

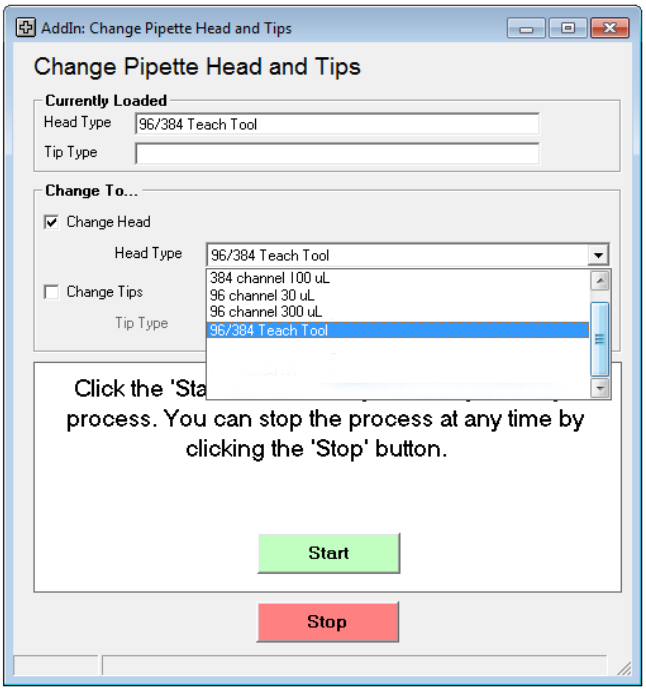
f. Wait for the system to complete the load sequence and home all axes. Various messages will be displayed. When complete, the system will display "Change Complete...". Close the window by clicking the "X" in the upper right-corner.

Note! If a head is already installed, simply open and close the door as requested to continue to work through the software/hardware interlock prompts.▲

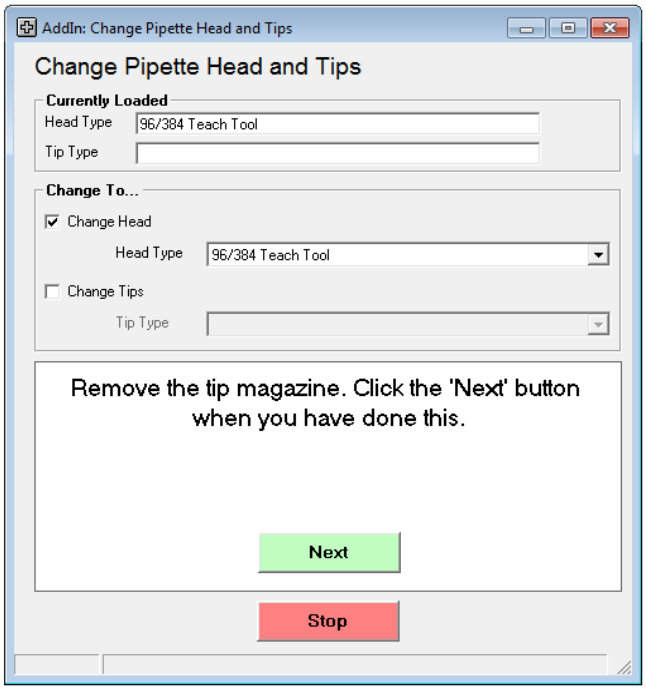
3. From the **Add-Ins** drop-down menu, select "**Change pipetting head and Tips**".



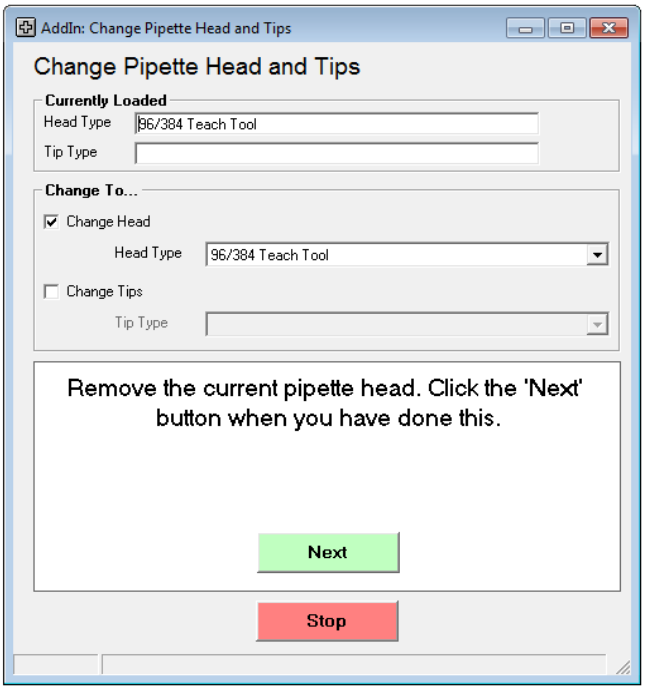
4. Place a checkmark in "**Change Head**" then use the scroll-down field to select "**96/384 Teach Tool**".



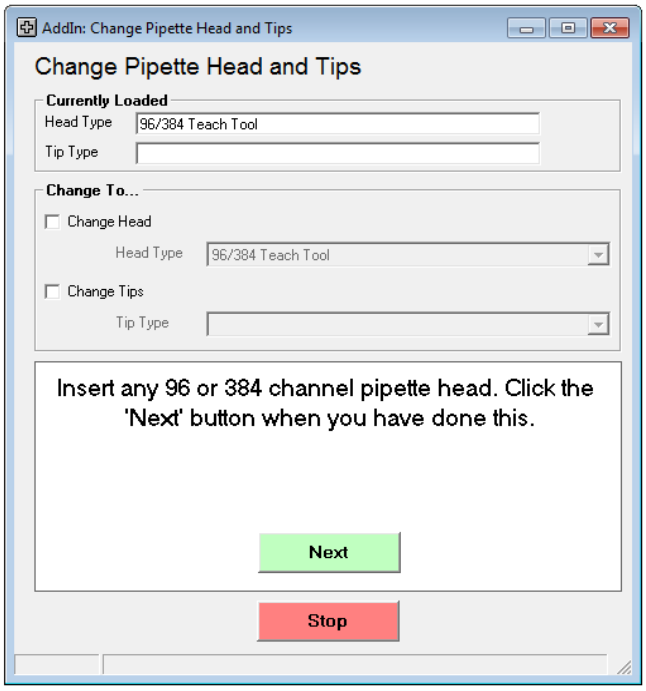
5. If a tip magazine is in the system, remove it, then click "**Next**".

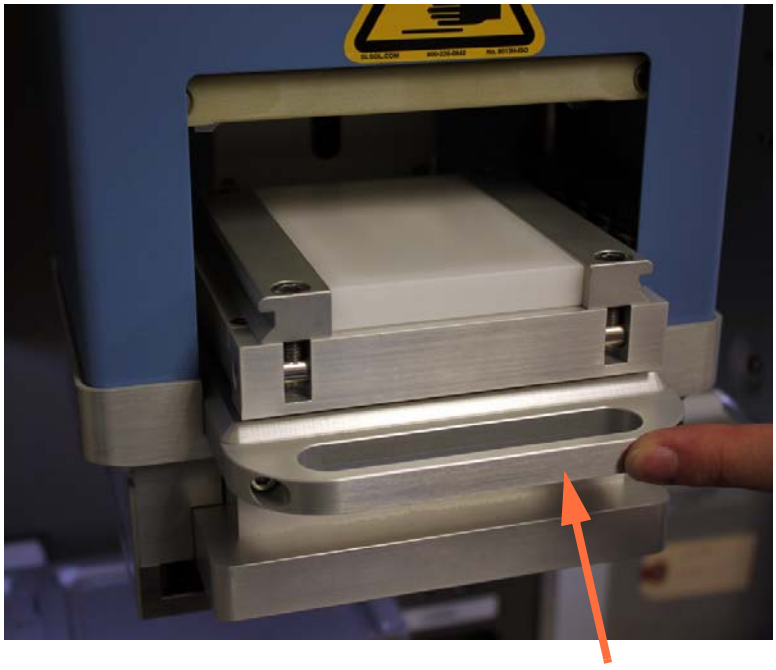


6. If a pipetting head is installed, remove it, then click "**Next**".



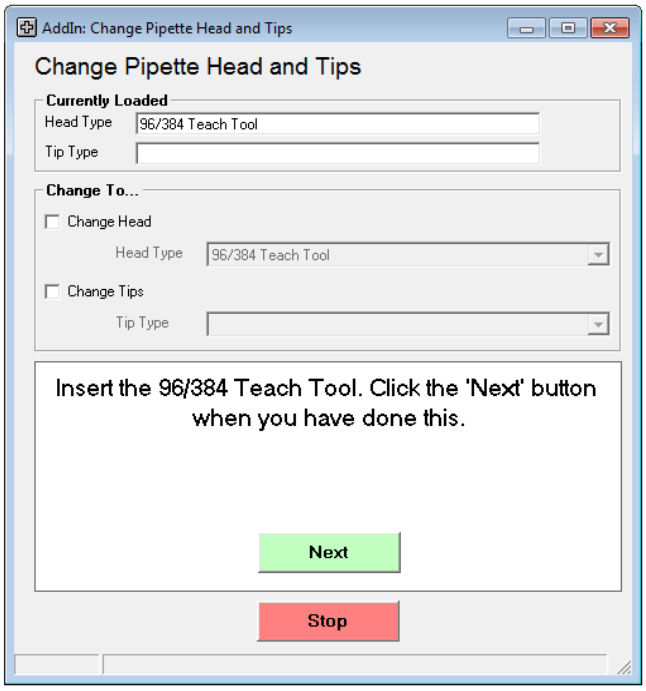
7. Insert any 96- or 384- channel pipetting head, then click the **"Next"**.





Press firmly in until the pipette head clicks in place.

8. Insert the 96/384 Teach Tool, then click **"Next"**.

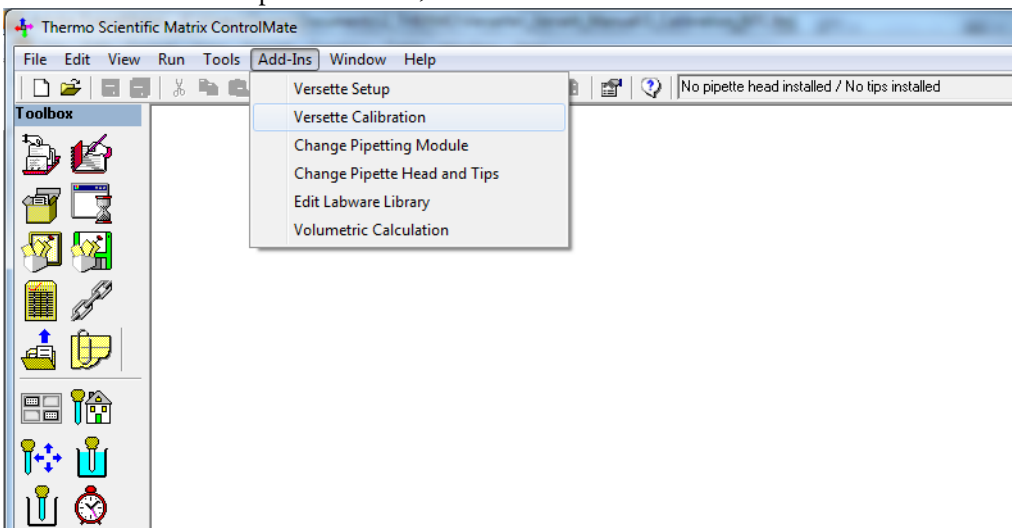


Press firmly in until the 96/384 teach tool clicks in place.

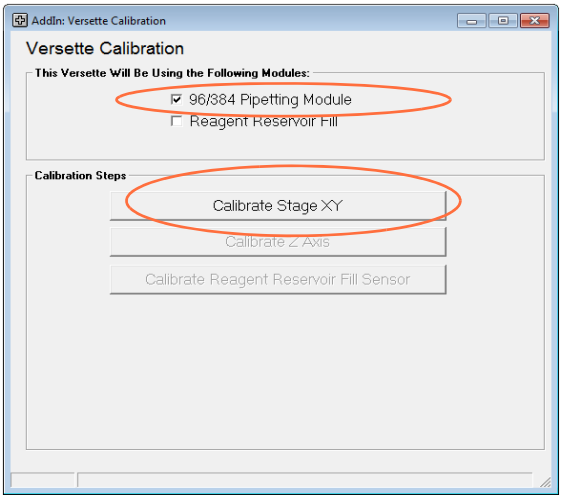
STEP 4: Calibrate Stage XY Coordinates

1. Place the **Calibration Plate** flat in position on Stage 2 with the "**96/384 PIPETTING HEAD**" side facing up.

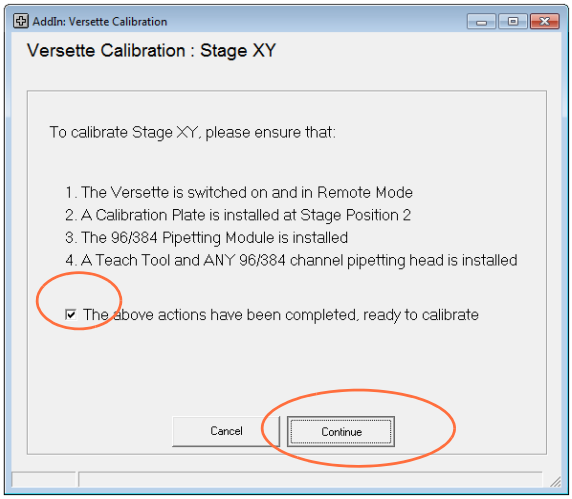
2. From the **Add-Ins** drop-down menu, select "**Versette Calibration**".



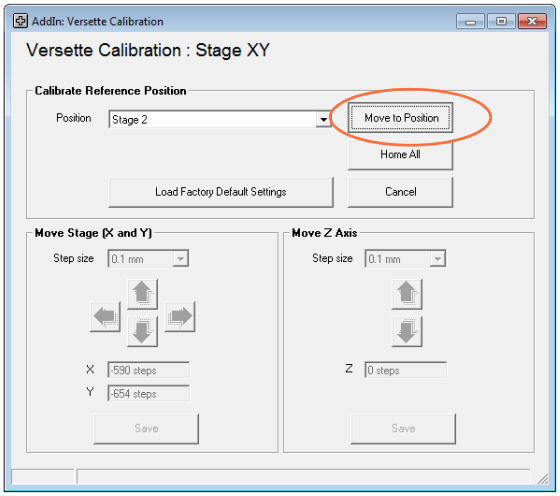
3. Select the 96/384 Pipetting Module then click "**Calibrate Stage XY**".



4. Read and comply with any instructions. Place a check mark as noted below when all conditions are met, then click "**Continue**".

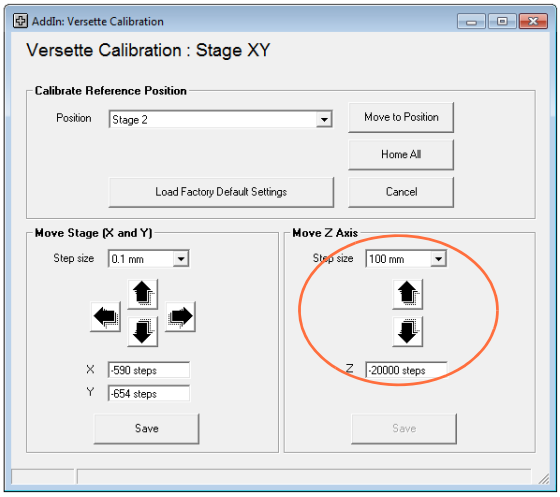


5. Select **Stage 2** from the drop-down menu (system defaults to Stage 2), then click "**Move to Position**".

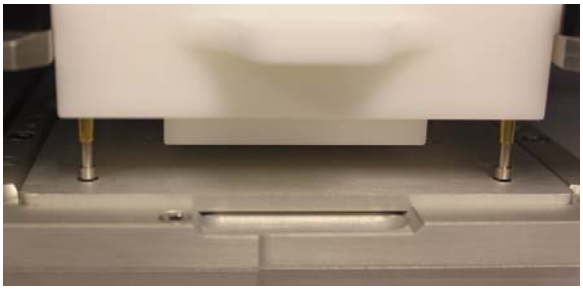


6. After Stage 2 has moved in position under the teach tool, use "**Move Z Axis**" to lower the teach tool to approximately 1 mm above the Calibration Plate.
   - Select the appropriate **Step size** (0.1 mm, 1 mm, 10 mm, etc.), then click the Down arrow to move the pipetting module closer to the stage position.

   CAUTION Use care when moving the pipetting module to avoid hitting the stage. Select the smallest reasonable **Step size**.▲

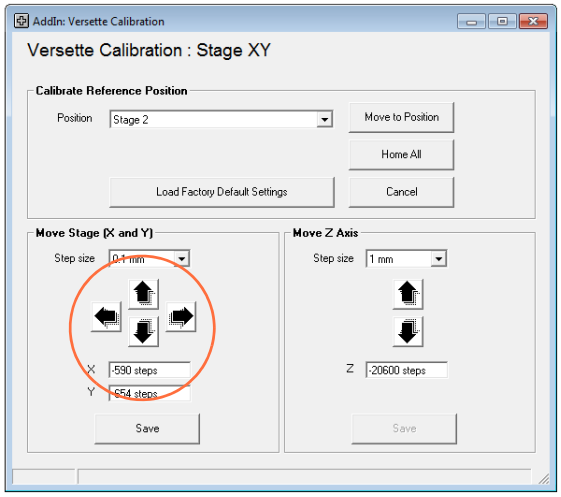


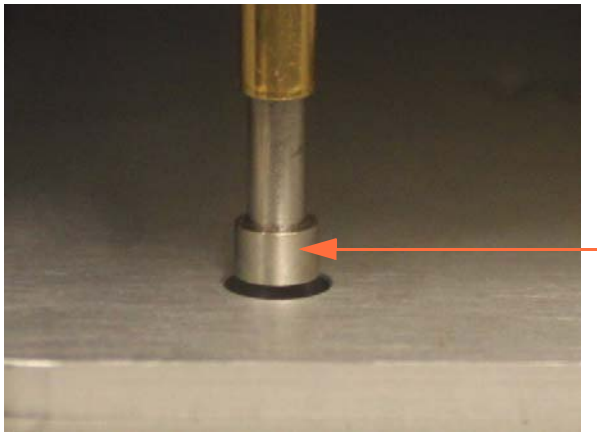
Lower NTC teach tool close to Calibration Plate.



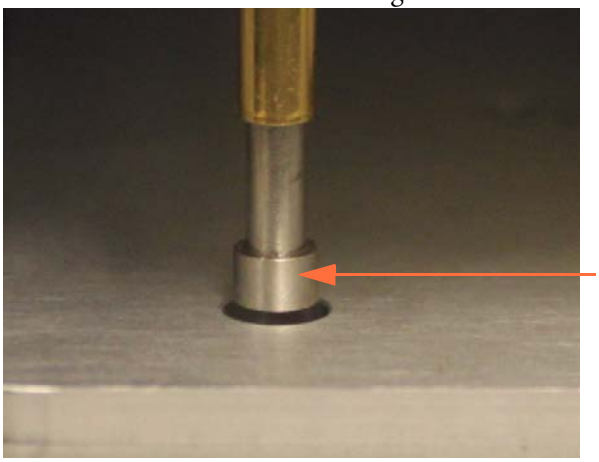
7. Check the alignment location. The teach tool posts should be positioned so that the posts will line up correctly to go into the plate holes.

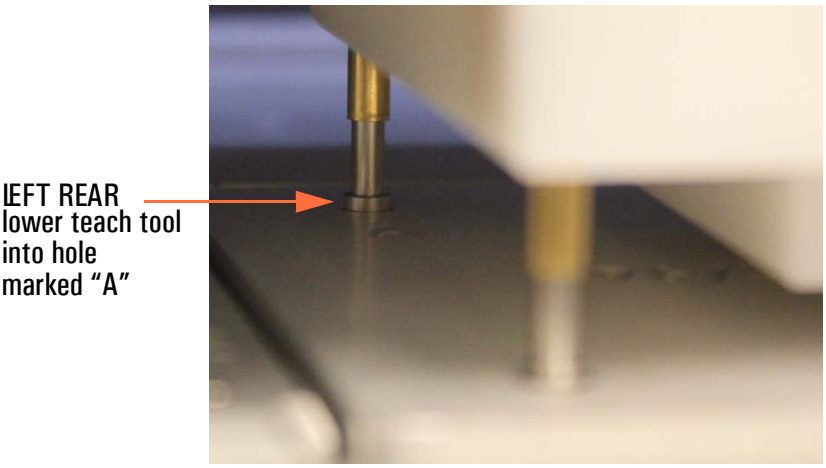
   If necessary, use the **Move Stage** (X and Y) commands to enter a **Step size** (typically 0.1 mm) then use the arrows to move the stage left or right, forward or back to achieve proper alignment. Take great care to ensure all four posts will line up properly into the plate holes. It is recommended to view the alignment from as many angles as practical.

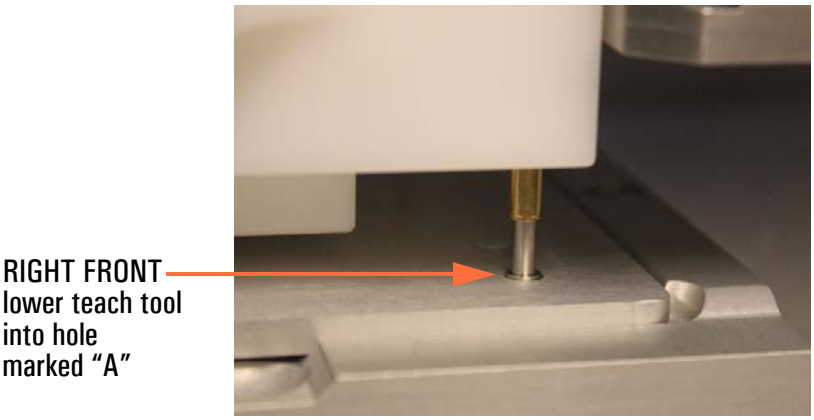




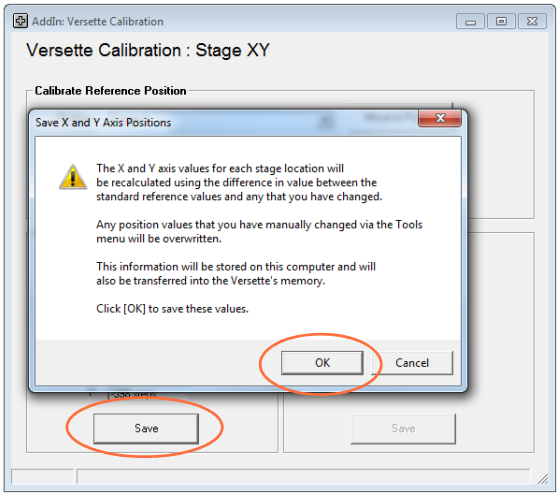
8. Lower the pipetting module slightly to verify that the X-axis and Y-axis alignments are properly set. Take care to check the left rear hole and the right front hole marked as "A" locations on the Calibration Plate are in alignment.





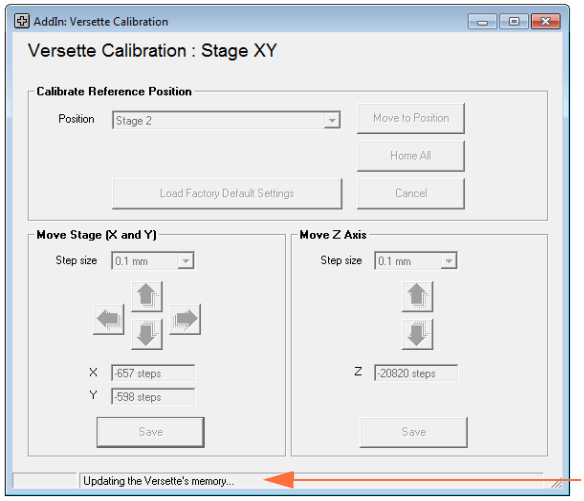


9. Click "**Save**" to save the calibration coordinates, read the message, then click "**OK**".



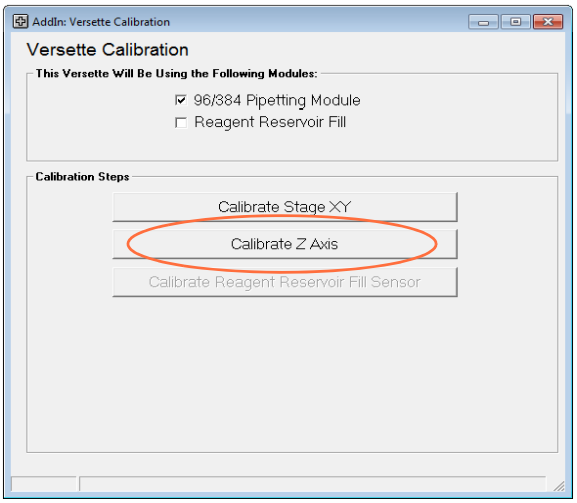
10. Wait approximately 15-30 seconds or more for the system to save the changes. Do NOT close the window! Once the values are saved to the computer, the machine homes the Z Axis. The window will close automatically and return to the Calibration Menu. Wait for the cycle to complete and all motions to stop.

IMPORTANT If you close the window before the calibration is saved, you will need to restart the entire calibration process. You may also need to power-cycle the ***Versette*** system.

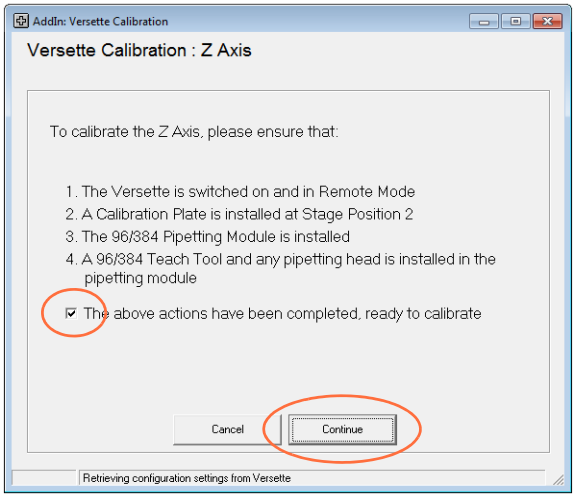


STEP 5: Calibrate the Z-axis

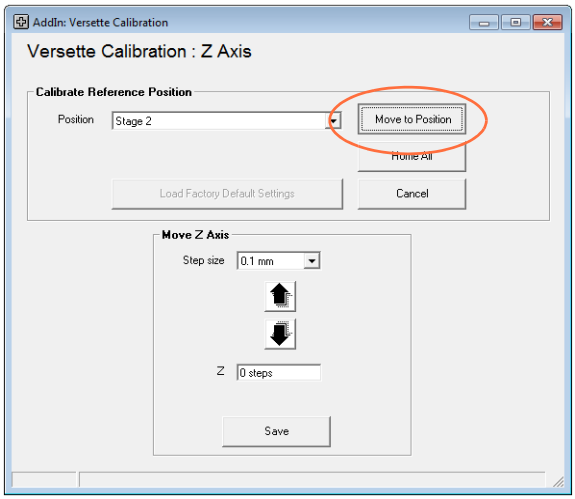
1. Select "**Calibrate Z-axis**".



2. Read the instructions and verify that all items have been completed, then select the check box to continue, then click "**Continue**" to begin the calibration process.



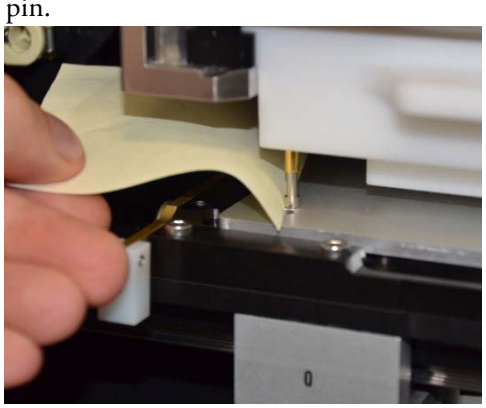
3. The Z-Axis is calibrated from Stage 2. Verify that Stage 2 is displayed in the position box, then press "**Move to Position**." The head and stages will move to position the Teach Tool over the Calibration Plate on Stage 2.

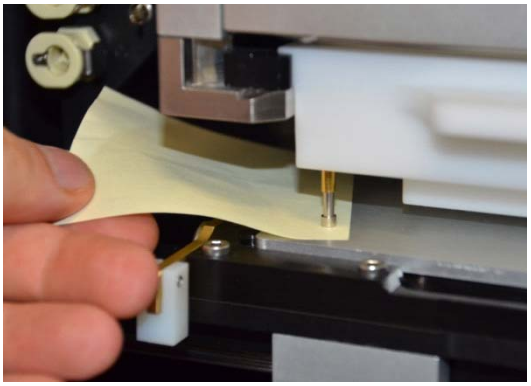


4. Set the **Step size**, then use the arrows to move the teach tool down until it is just touching the calibration plate.

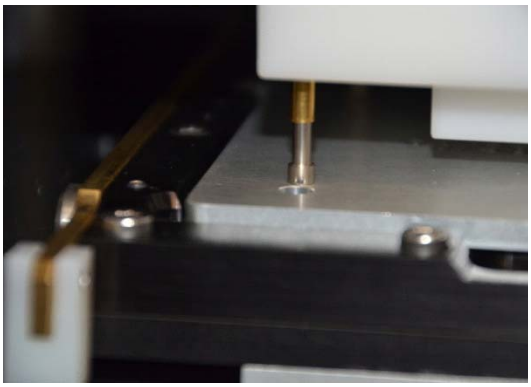
5. Take a piece of paper the thickness of a standard notepad paper or a sticky note and try to slide the paper underneath the left front calibration pin. If the pin is touching the plate you should not be able to slide the paper underneath the pin.

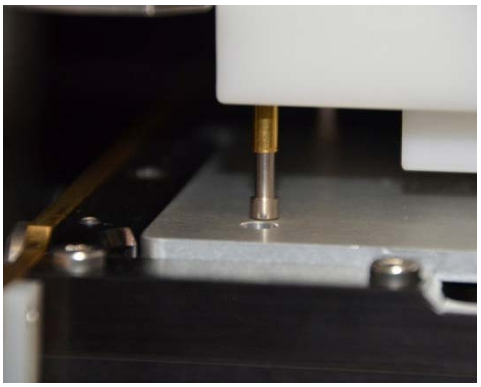
6. Move the step size up by 0.1mm increments until the paper can just slide underneath the pin.





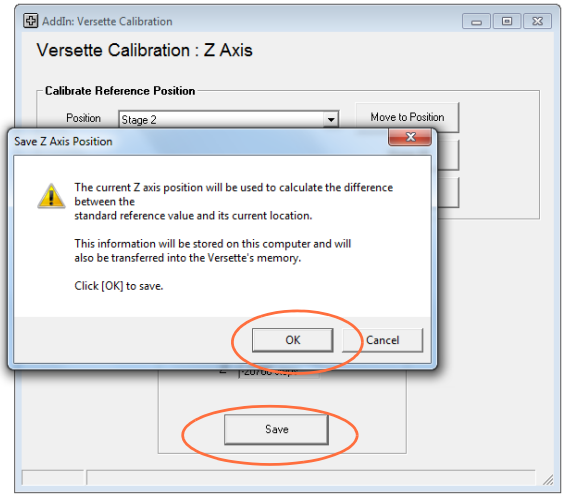
Note! For experienced users, you can also just visually verify that the pin is just off the calibration plate without using the piece of paper as a guide. Ensure that the left front pin is just touching the plate and then move the step size up by one 0.1mm increment.





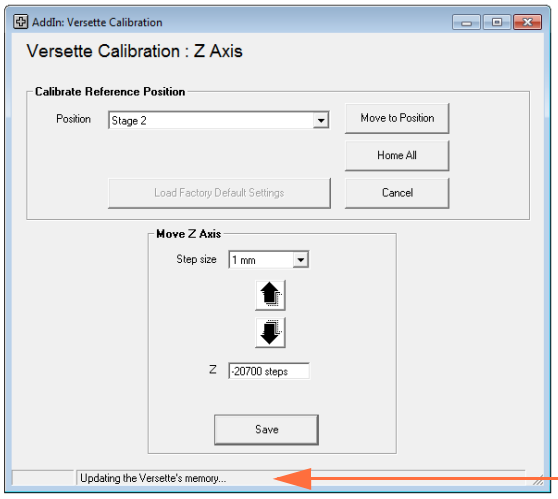
CAUTION If the front pins are different heights, use the longest pin.

7. Click "**Save**" to save the new calibration coordinates, then click "**OK**" on the pop-up window.



8. Wait approximately 15 to 30 seconds for the system to save the changes. Do NOT close the window! The window will close automatically and return to the Calibration Menu. Once changes are made, the machine will go through a homing cycle. Wait for the cycle to complete and all motions to stop.

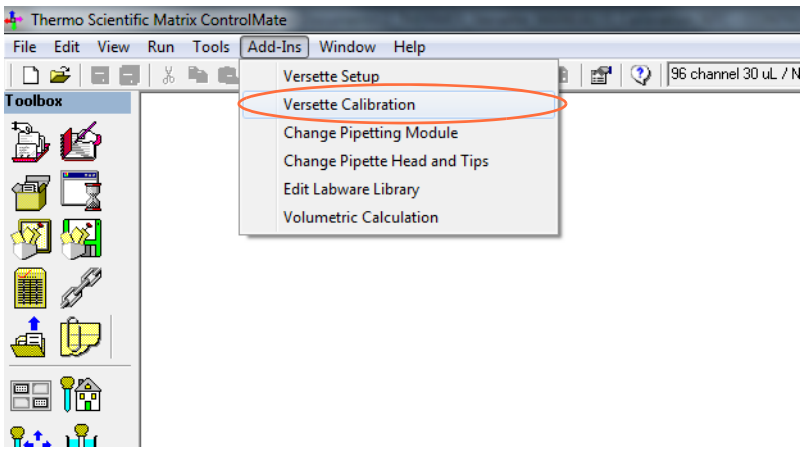
IMPORTANT If you close the window before the calibration is saved, you will need to restart the entire calibration process. You may also need to power-cycle the ***Versette*** system.▲



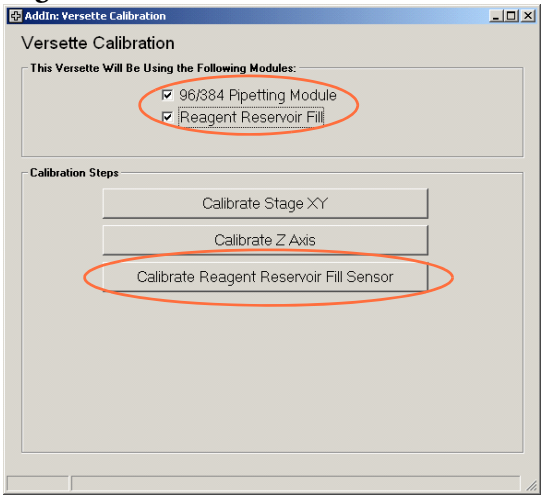
STEP 6: Calibrate Reagent Reservoir Fill Sensor

The following procedure should be used to calibrate the optional Reagent Reservoir Fill Sensor.

1. Select "**Versette Calibration**" from the Add-Ins menu, as shown:

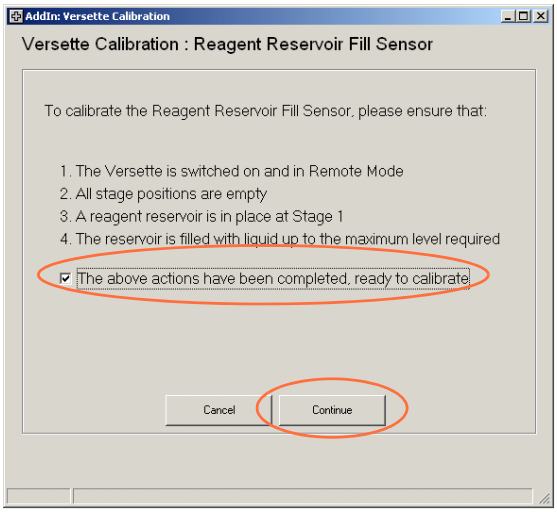


2. Ensure the "**96/384 Pipetting Module**" is already selected with a check mark, select "**Reagent Reservoir Fill**" module, then click "**Calibrate Reagent Reservoir Fill Sensor**".



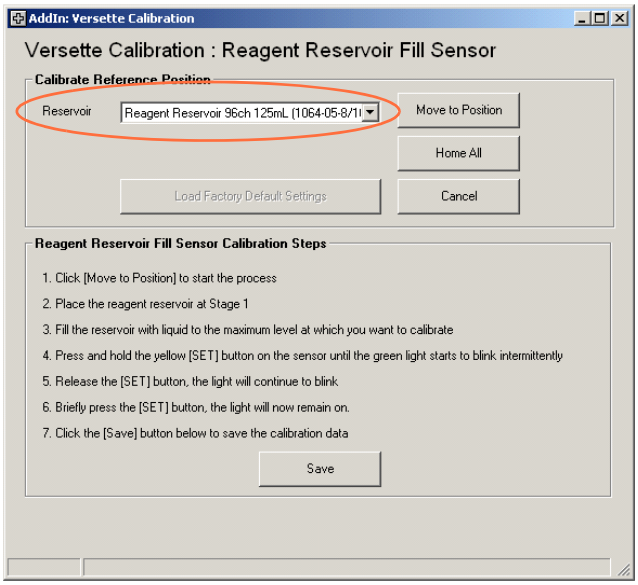
CAUTION DO NOT uncheck and re-check 96/384 module checkbox after ***Versette*** system has been calibrated as the machine could lose calibration parameters and might need to be re-calibrated.▲

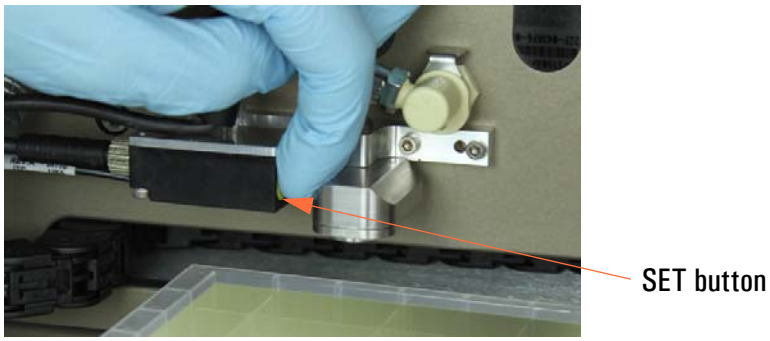
3. Read and verify all displayed requirements on the screen, then confirm by clicking on the check box area (see below) then select "**Continue**".



4. Select the Reservoir type from the pull-down menu, then follow the on-screen calibration steps:

    1. Click “Move to Position” to start the process
    2. Place the reagent reservoir at Stage 1
    3. Fill the reservoir with liquid to the maximum level at which you want to calibrate
    4. Press and hold the yellow (SET) button on the sensor until the green light starts to blink intermittently
    5. Release the SET button, the light will continue to blink
    6. Briefly press the (SET) button, the light will now remain on
    7. Click the (SAVE) button on the screen to save the calibration data





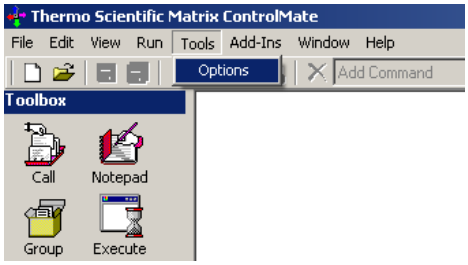
STEP 7: Optimizing Additional Stage Positions

This step is performed in order to ensure all the stage positions have been properly calibrated based off the data that was referenced from calibrating the Stage 2 position.

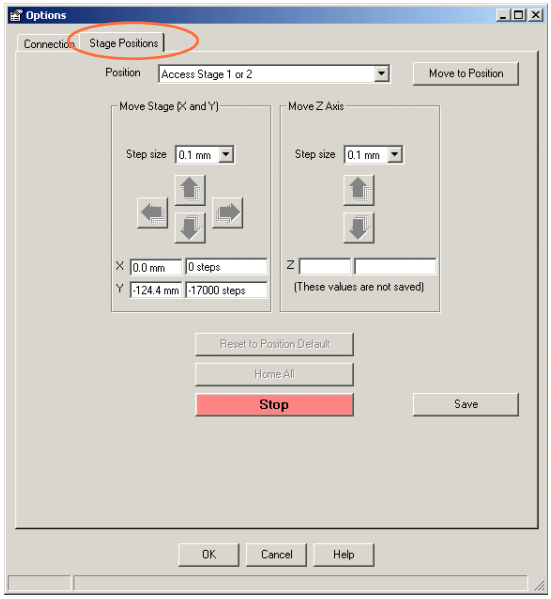
In principle, once the Stage 2 position has been calibrated, all remaining stage positions (1,3,4,5,6) should also be in alignment. However, it is good practice to double-check and if necessary, make slight adjustments to the remaining stage positions as needed. This step is optional and can be performed at a later time if any of the stage positions need to be streamlined to work with a specific piece of labware that is either current in the default drop down list to choose from, or a new piece of labware that has been entered for use with a protocol/sequence. For information on adding/modifying/deleting labware refer to Editing the Labware Library section of this manual.

1. If not already installed, you will need to install any pipetting head and the 96/384 teach tool into the NTC pipetting module. Refer to "STEP 3: Install the NTC Pipetting Module and NTC Teach Tool" on page 34 for details on changing the pipette head.

2. From the Tools menu, select Options.



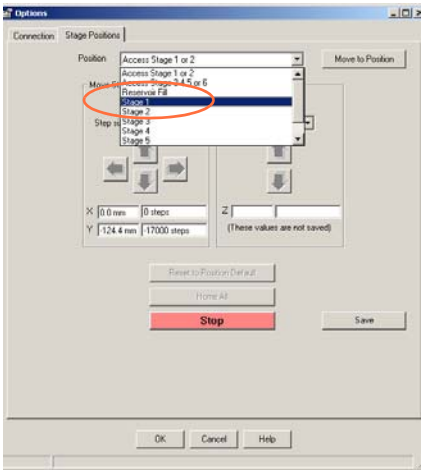
3. When the Options window opens, select the Stage Positions tab.

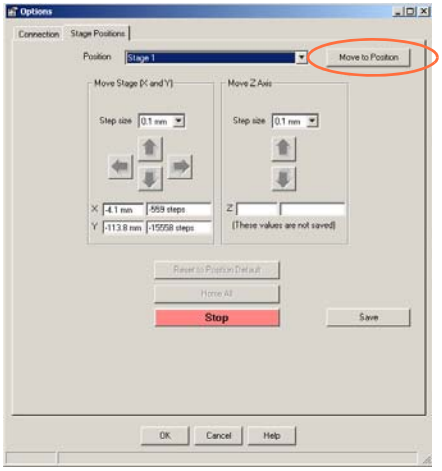


4. From the drop down menu, select one of the remaining stages to be verified/calibrated (1, 3, 4, 5, or 6). Since stage position 2 has already been calibrated, you do not need to verify/calibrate this position.

5. Place the Calibration Plate flat in position on Stage 1 with the "96/384 PIPETTING HEAD" side facing up.

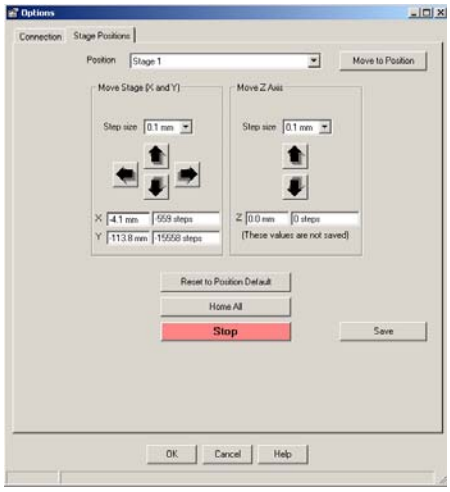
6. Select Stage 1 from the drop-down menu then click "Move to Position".





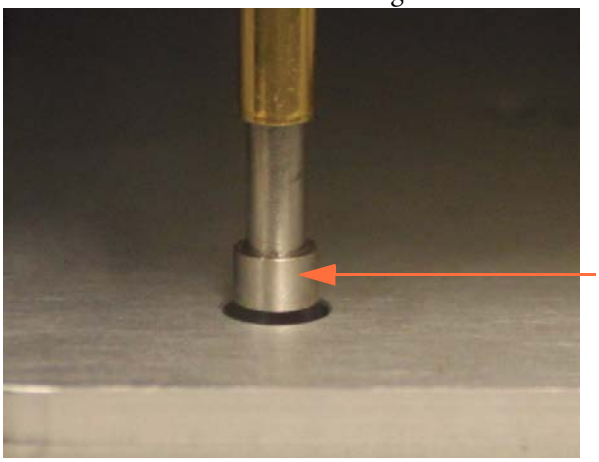
7. After Stage 1 has moved in position under the teach tool, use "Move Z Axis" to lower the teach tool to approximately 1 mm above the Calibration Plate. Select the appropriate Step size (0.1 mm, 1 mm, 10 mm, etc.), then click the Down arrow to move the pipetting module closer to the stage position.

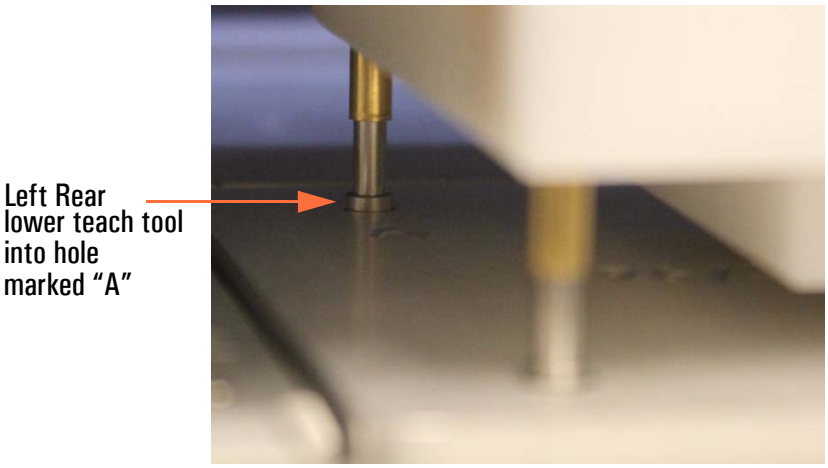
CAUTION Use care when moving the pipetting module to avoid hitting the stage. Select the smallest reasonable Step size.▲

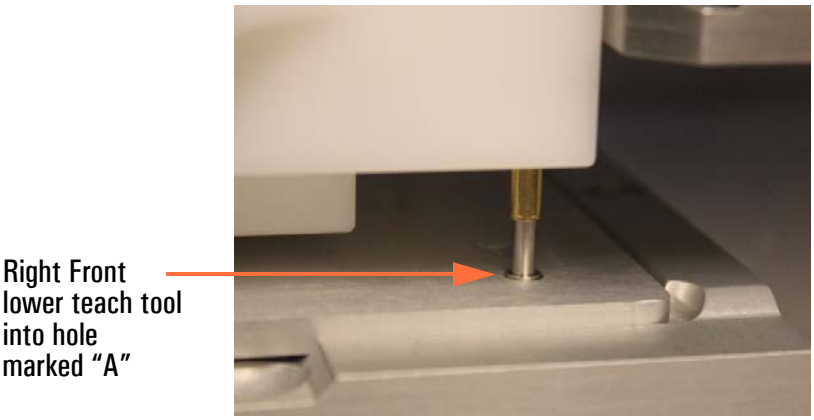


Lower NTC teach tool close to the Calibration Plate.

8. Lower the pipetting module slightly to verify that the X-axis and Y-axis alignments are properly set. Take care to check the left rear hole and the right front hole marked as "A" locations on the Calibration Plate are in alignment.

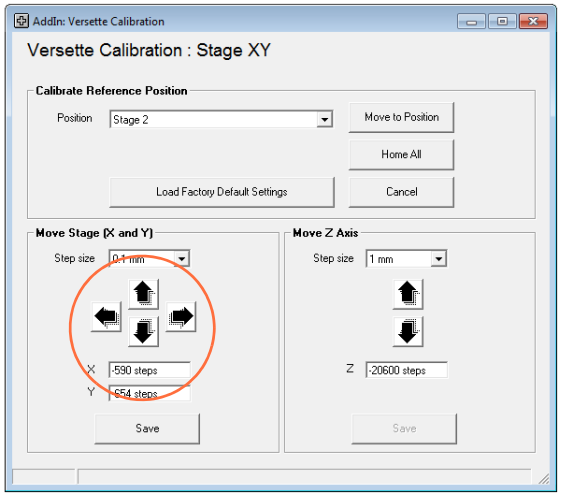


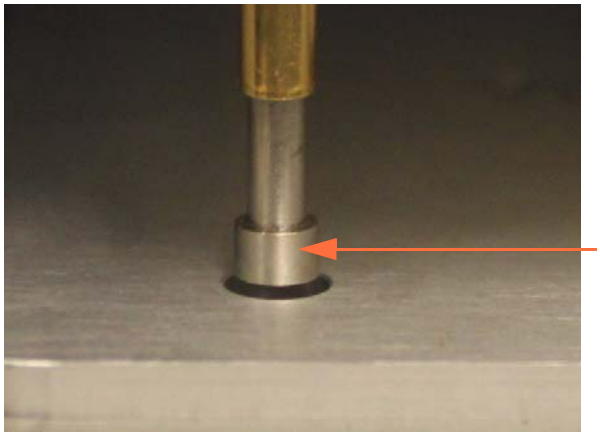




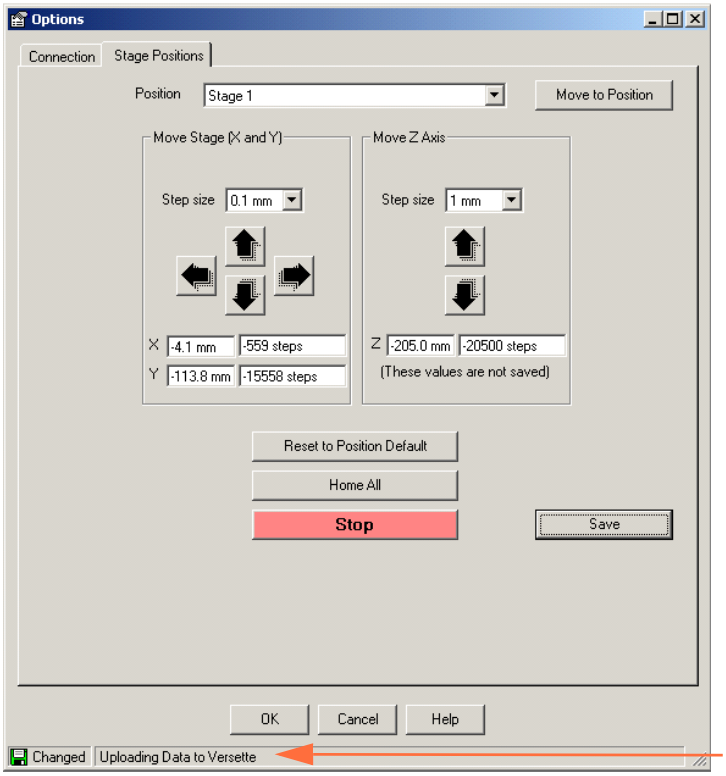
9. Check the alignment location. The teach tool posts should be positioned so that the posts will go into the plate holes.

   If necessary, use the **Move Stage** (X and Y) commands to enter a **Step size** (typically 0.1 mm) then use the arrows to move the stage left or right, forward or back to achieve alignment. Take great care to be as ensure all four posts will go into the plate holes. It is recommended to view the alignment from as many angles as practical.





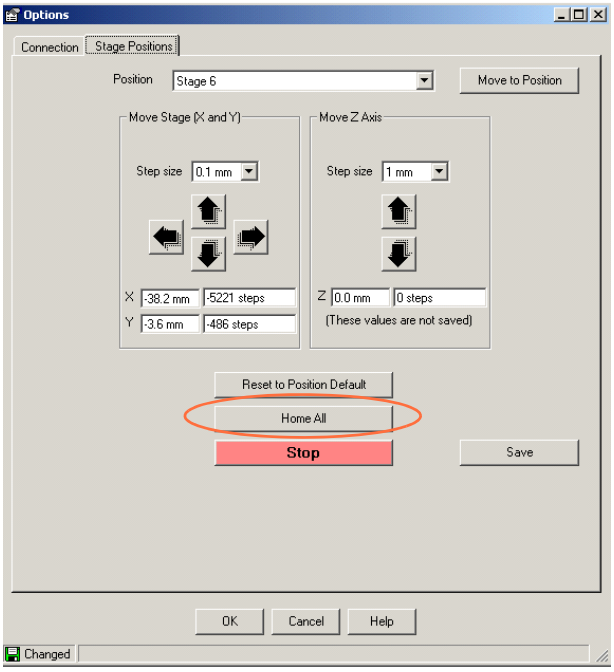
10. If you did not make any changes to either the X or Y axis steps, then skip to step 13.
11. If you have made changes to either the X or Y axis steps, then click "Save" to save the new calibration coordinates.
12. Wait approximately 15-30 seconds or more for the system to save the changes. Do NOT close the window! Once the values are saved to the computer, the "Uploading Data to Versette" message disappears. The Z axis remains lowered in the calibration plate and does not automatically home.



CAUTION IMPORTANT NOTICE: If you close the window before the calibration is saved, you need to restart the entire calibration process. You may also need to power-cycle the ***Versette*** system.▲

13. Repeat steps 4 through 12 until all remaining stage positions have been verified/calibrated.

14. After the last stage position has been completed, click on the Home All button. The machine homes the Z Axis and homes the stage to the left of the machine. Wait for the cycle to complete and all motions to stop.



15. Close the Options window.

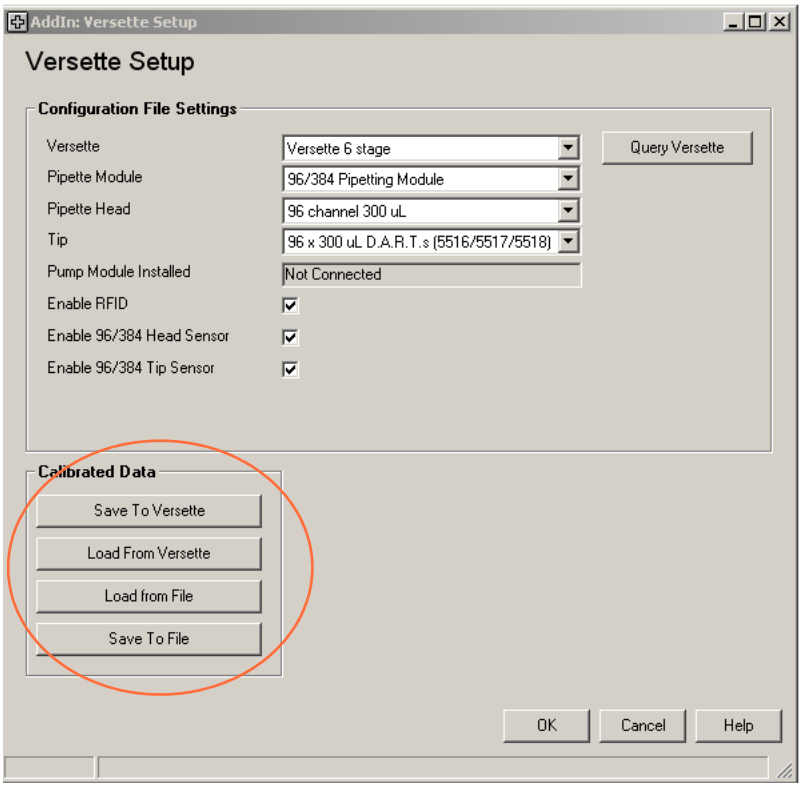
Saving, Recalling, and Backing Up Calibrated Data

Calibrated data includes stage coordinate calibration data. When a ***Versette*** system is calibrated, the calibration data is stored in the ControlMate Data Folder on the computer where the calibration of the machine was performed and automatically saved to the ***Versette*** system.

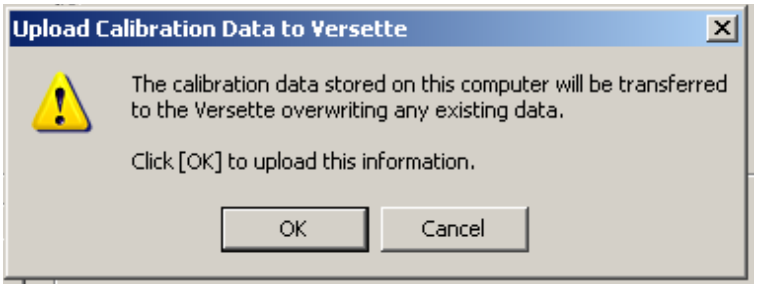
Calibrated Data (Download Buttons in Versette Set Up)

Using the Calibrated Data buttons saves calibration status for each axis (S,X,Y,Z), identifies what was last used, if reagent reservoir fill was calibrated, head type info, saves position information, etc.

When the machine is calibrated and coordinates are saved, the calibration data is stored in both the CM Data folder (Versette.ini file) and the machine.



Save to Versette

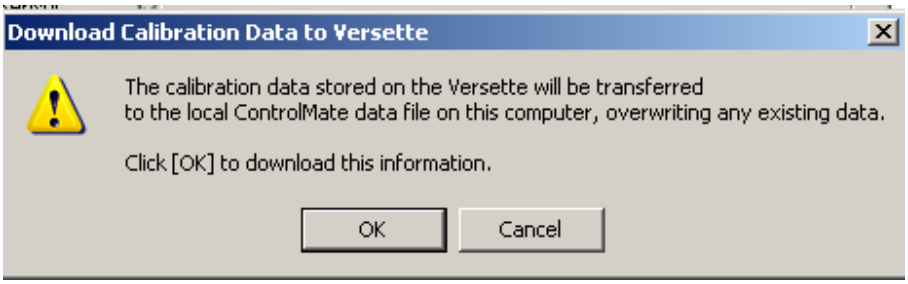


Uploads the calibration data stored in the CM Data folder to the machine.

Example: When a new Firmware version is loaded, the calibration data stored in the CM Data folder needs to be saved back to the Versette.

Note! Labware Library custom entries and volumetric calculations are not affected or overwritten.

Load from Versette

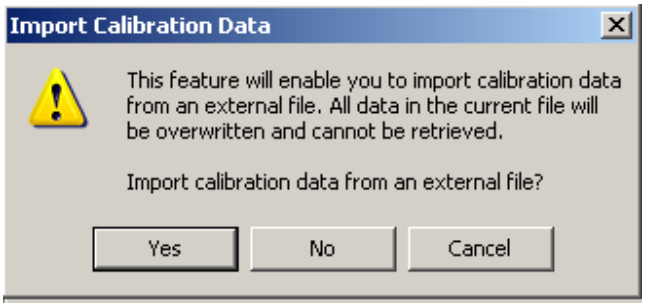


Downloads the data from the machine to the CM Data folder.

Example: When a new workstation is set up, the calibration data stored on the machine needs to be saved into the CM Data folder.

Note! Labware Library custom entries and volumetric calculations are not affected or overwritten.

Save to File

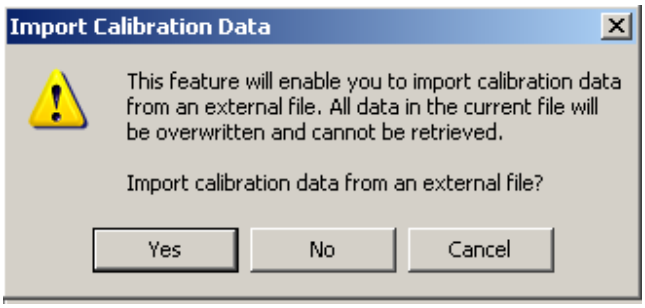


Exports the data from the CM Data folder to a saved backup file, the user can specify the file name.

Example: As a precaution the user wants to save a copy of the calibration data so the machine doesn't have to be recalibrated from scratch. The file can be loaded back into the CM Data folder using "Load from File".

Note! Labware Library custom entries and volumetric calculations are not affected or overwritten.

Load from File



Imports the data from a saved backup file to the CM Data folder.

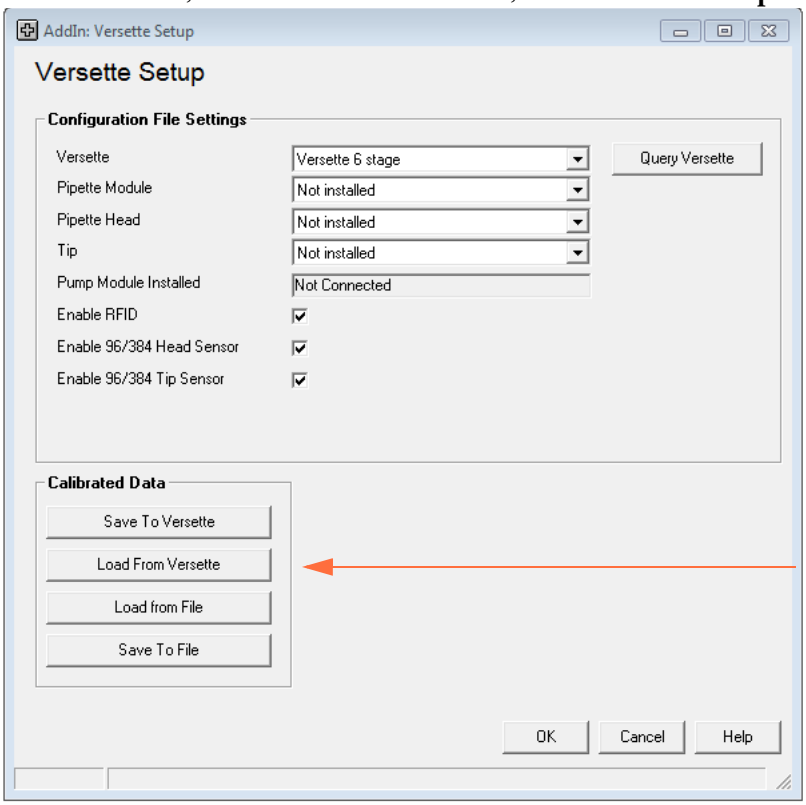
Example: If different workstations are used with a single machine, the calibration data stored from the saved external file needs to be saved into the CM Data folder for each workstation.

Note! Labware Library custom entries and volumetric calculations are not affected or overwritten.

Calibrated Data / Backing Up Versette Files

This should be done periodically to ensure you have the most current information saved in case you need to change / upgrade workstations or recover calibration data from the ***Versette***.

1. In ControlMate, from "**Add-Ins**" menu item, select "**Versette Setup**".



Calibration data file handling options

2. Select "**Save To File**" to save a copy of the calibration data to a file on your computer.
3. Save the file to a backup location, for example, the computer desktop, C:Drive, data folder, flash drive, etc.
4. Rename the file by placing an identifier in the front of it, e.g. today's date: 10-13-12VersetteINIExport.bak

Labware Library

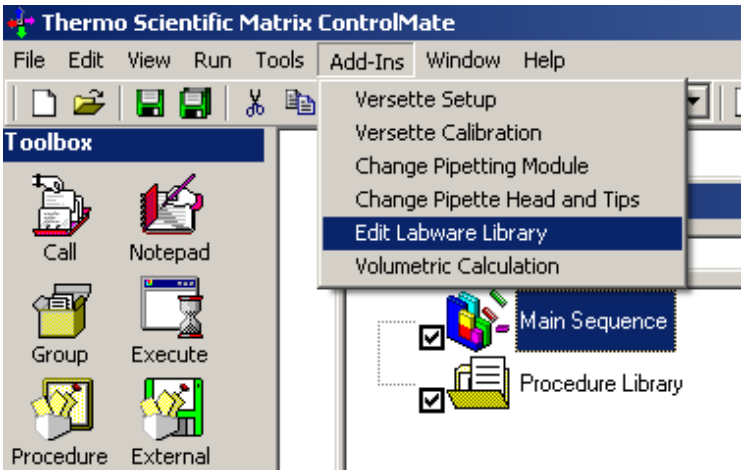
The ControlMate software comes pre-loaded with an electronic ‘library’ of pre-loaded labware dimensions. This selection of predefined microplates and tubes allows instant use of a variety of labware by ControlMate and the Versette system. The “Edit Labware Library” function (detailed in the following pages) allows a user to modify, add, or delete labware entries. Information for each piece of labware can will include dimensional shapes, widths, spacing, overall height, liquid handling depths, and all critical dimensions required to ensure proper operation.

Editing/Entering Labware Items

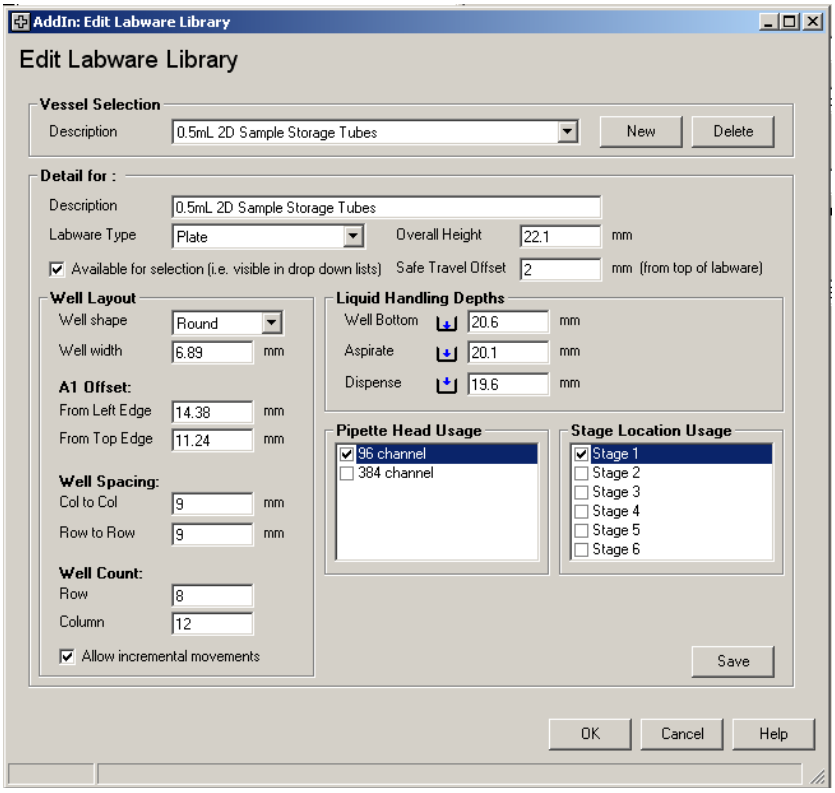
There are two approaches for editing/entering labware items:

- Use existing labware as a template to create new custom items: Modifying existing labware is when you have a piece of labware that has almost the same dimensions as the custom piece you are entering. Use an existing default labware selected from the drop down menu to modify:
  - name of an existing piece of labware - without changing the dimension parameters
  - dimension parameters of an existing labware item - resaving with current name
  - the name / dimension parameters
- Enter a new item: this is when you create custom labware from scratch that is not already pre-loaded into the library and not available from the drop down menu as a guide. Enter the dimensions and parameters in appropriate fields:
  - measure labware item with calipers
  - enter measurements / dimensions directly from a manufacturer's specification sheet

1. From the Add-Ins menu, select "**Edit Labware Library**".



The Edit Labware Library window opens with default information for the first labware item in the Labware Library list from the drop down menu.



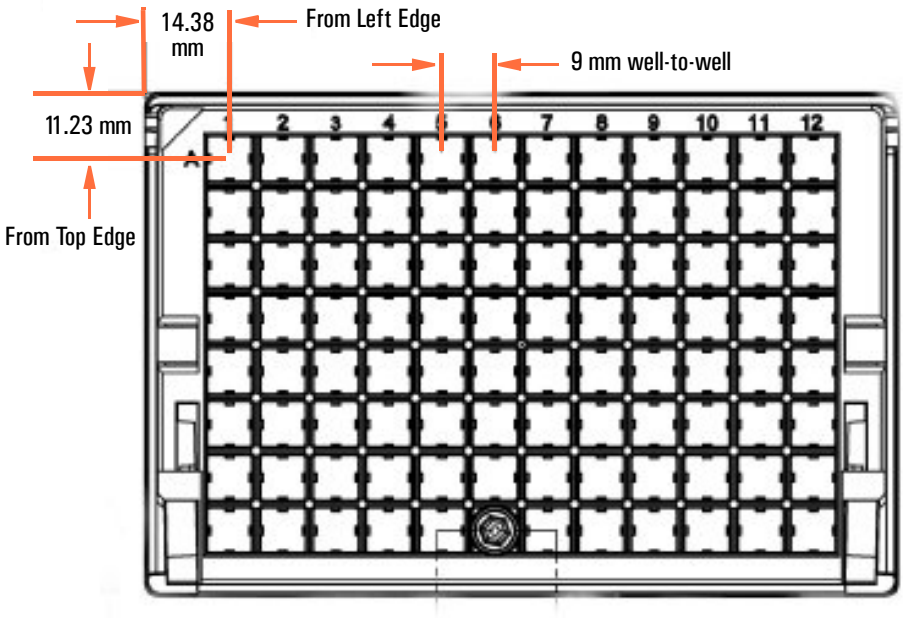
Edit Labware Library Screen Details

There are nine sections that need to have the dimensions and parameters of labware items entered.

- Vessel Selection
  - Description: this is the title of the labware item selected from a drop down menu. The description field lists the different names of the labware items to be used within a protocol. If you click on the drop-down arrow you'll notice that there are over 50 items that are entered as default labware. They are listed in order by numeric first, followed by alpha entries.
    - NEW: enter in a new labware item into the drop down menu when selecting a vessel type in the Move To Position step in a sequence
    - DELETE: permanently removes a labware item from the drop down menu when selecting a vessel type in the Move To Position step in a sequence
- Detail For
  - Description: title of the labware item selected from the drop down menu is listed
  - Labware Type: plate, reservoir, tip wash
  - Overall Height: total height of the labware item (including the skirt of a plate, rack, etc.)
  - Available for Selection (i.e. visible in drop down lists): if check box is selected, the labware is shown in the drop down menu for selecting a vessel type in the Move To Position step in a sequence
  - Safe Travel Offset: safe height that the tips travel above the labware selected: default 2mm
- Well Layout
  - Well Shape: shape of well: round, square, not applicable
  - Well Width: internal width of well, tube or vial

- A1 Offset
  - From Left Edge: measuring into the A1 center well from the left edge of plate: default based on 96 well plate 14.38mm
  - From Top Edge: measuring into the A1 center well from the top edge of plate: default based on 96 well plate 11.23mm

  Note! In places where you can't move equal distances across a plate, reservoir, using non conventional plates or labware with staggered wells (e.g. honeycomb, divided reservoirs) the tips won't line up properly to do custom incremental adjustments.



- Well Spacing
  - Col to Col: measuring the well to well center in a column-wise direction: default based on 96 well plate 9mm on center, 384 well plate 4.5mm on center
  - Row to Row: measuring the well to well center in a row-wise direction: default based on 96 well plate 9mm on center, 384 well plate 4.5mm on center
- Well Count
  - Row: total number of rows available
  - Column: total number of columns available
  - Allow incremental movements: if check box is selected, the labware item can be used to perform incremental movements across a plate; useful for serial dilutions

  Note! In places where you can't move equal distances across a plate, reservoir, using non conventional plates or labware with staggered wells (e.g. honeycomb, divided reservoirs) the tips won't line up properly to do custom incremental adjustments.

- Liquid Handling Depths: these are the depths that the tip will go down into the labware; i.e., plate, tube rack. These heights are not only based on what you enter, but take into consideration the type of tip you select in your protocol. ControlMate software takes into fact the length of tip in conjunction with the depths entered for specific labware choices. Liquid handling depths pre-entered are guidelines for entering the heights. However, based on the protocol and depths you need to go into the plate or tube rack, you can adjust these accordingly.

  Note! Liquid handling depths can be adjusted in the Edit Labware Library section for your labware (recommended) or in the actual protocol in the aspirate or dispense steps. In the aspirate or dispense steps the liquid handling depths are listed as the 'predefined' heights from a drop down menu that are selected. Or, you could also choose a 'specific' height that is measured from the well top. The reason why you should adjust the actual liquid handling depths in the Labware Editor is the heights (once optimized) selected from the predefined heights will be consistent throughout your protocols based on the labware item selected. If you select to use the 'specific' height, you would need to ensure all your aspirate and dispense steps have the same selected height measurement entered throughout the protocol. Here you could accidentally forget to enter it or you would have to remember the measurement needed.▲

  - Well Bottom: height is measured from top of well to well bottom (tip actually touches the bottom of the well)
  - Aspirate: measurement of aspirate height (typically 2mm above well bottom)
  - Dispense: measurement of dispense height (typically 2mm below well top)
- Pipette Head Usage: ability to select the pipetting heads to use with a labware item
  - Check boxes for 96, 384 heads: select the appropriate heads compatible with your labware
- Stage Location Usage: ability to select stage locations to use with a labware item
  - Check boxes for all stages locations: select the appropriate stages compatible with your labware. Some labware items, i.e., tube racks may be too tall to place on the upper stage positions and could potentially interfere with proper head/tip movement. It is suggested to use taller labware items on the lower stage positions (1,2) as appropriate.

Modify Existing Labware

There are several ways to modify an existing piece of labware. Use an existing default labware selected from the drop down menu to modify:

Override current piece of labware without having to create a New item

a. dimension parameters of an existing labware item without changing the labware name - resaving with new dimension parameters with current name

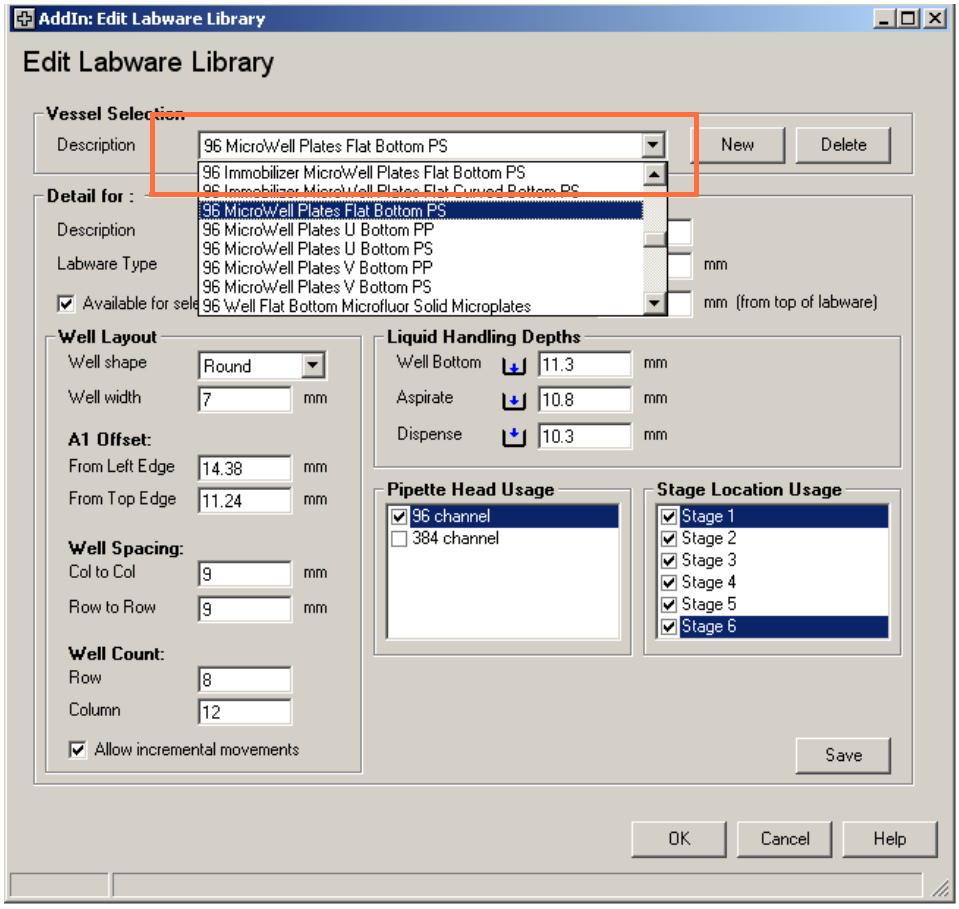
- Requires creating a New piece of labware

b. name of an existing piece of labware without changing the dimension parameters - resaving with new name

c. both the name / dimension parameters - resaving with new dimension parameters and new name

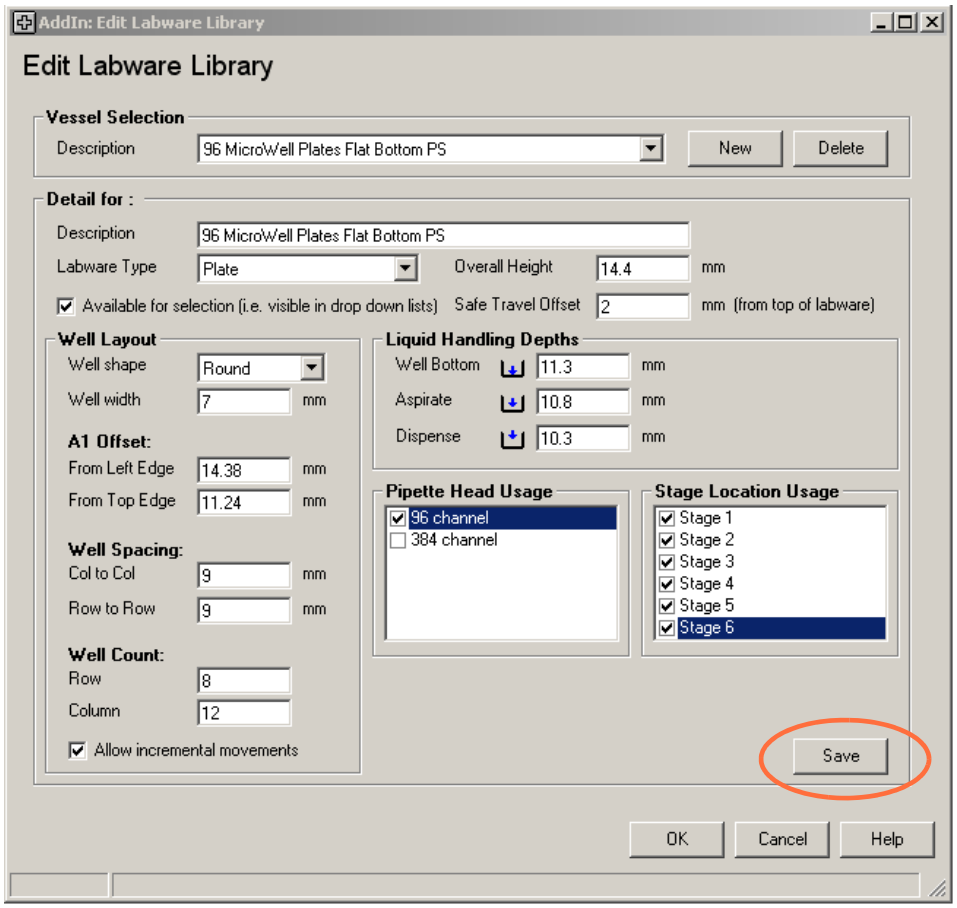
Changing Dimension Parameters and Resaving with Same Name

1. To modify an existing piece of labware or simply override the dimensions of a current labware item and resave using the same name (example a), select a similar labware item from the existing drop down list in the description in Vessel Selection.



2. Edit the dimension parameters for the appropriate fields.

3. Click Save.



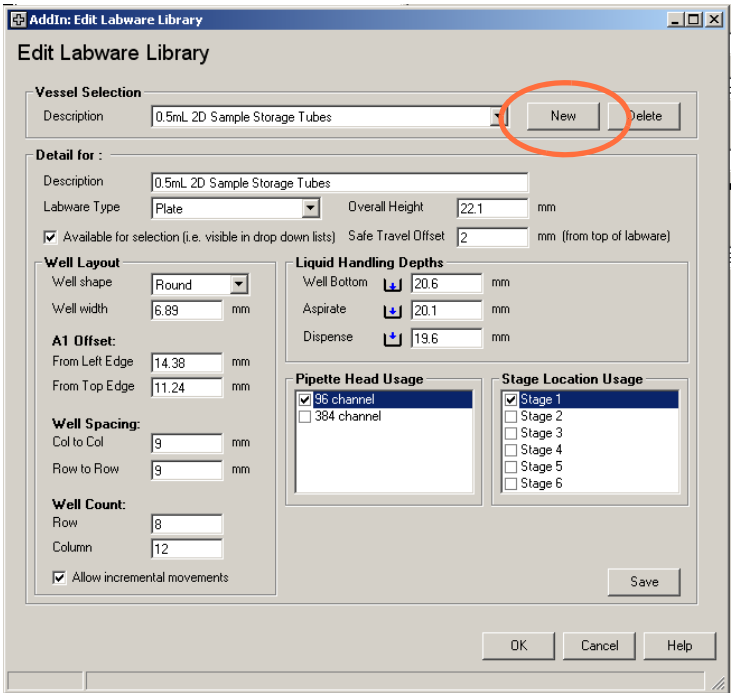
4. Once the plate type is resaved, the new dimensions are applied to this labware item. The labware item appears in the drop-down menu on the description field in the Edit labware Library (for future editing) and within the Move To Position to select your new vessel type from the Labware Library.

Name Change Only

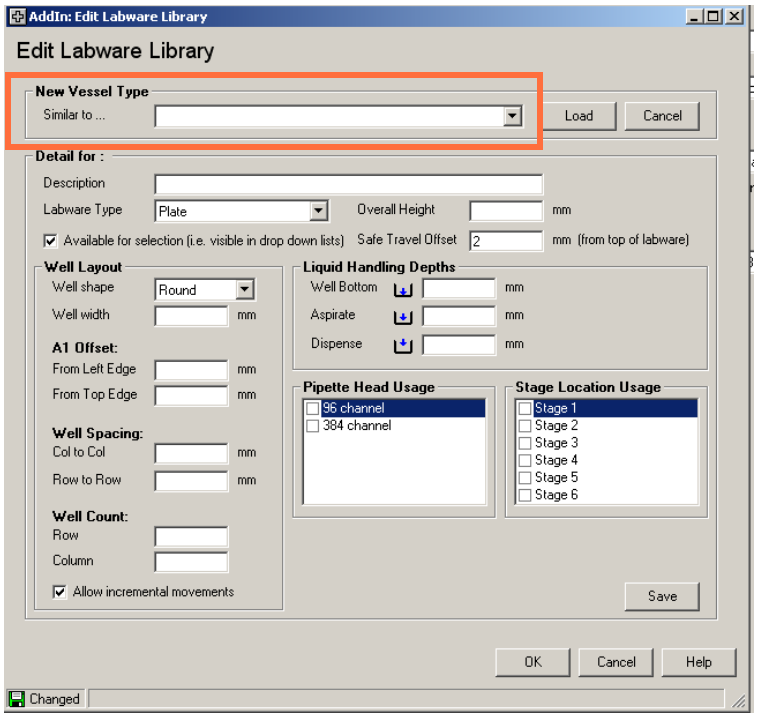
If Changing the Name and Dimension Parameters, follow this same Guideline (example c).

To modify an existing piece of labware and rename it (example b), select a similar labware item from the existing drop down list in Vessel Selection.

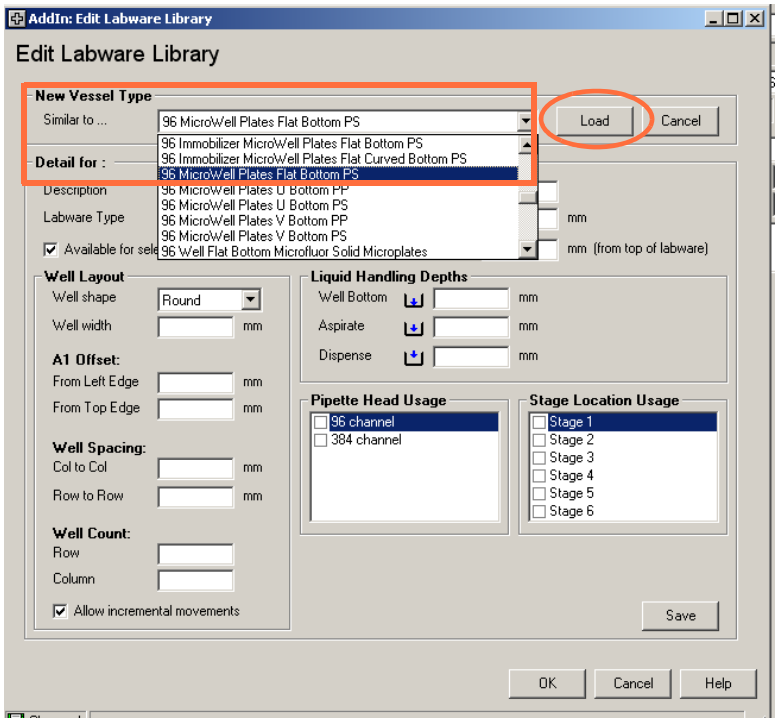
1. The first step is to click on the New button.



2. An Edit Labware Library screen appears to enter in a new vessel type. All the fields are cleared as ControlMate is waiting for your next step. A section named New Vessel Type appears with a Similar to…drop down menu.



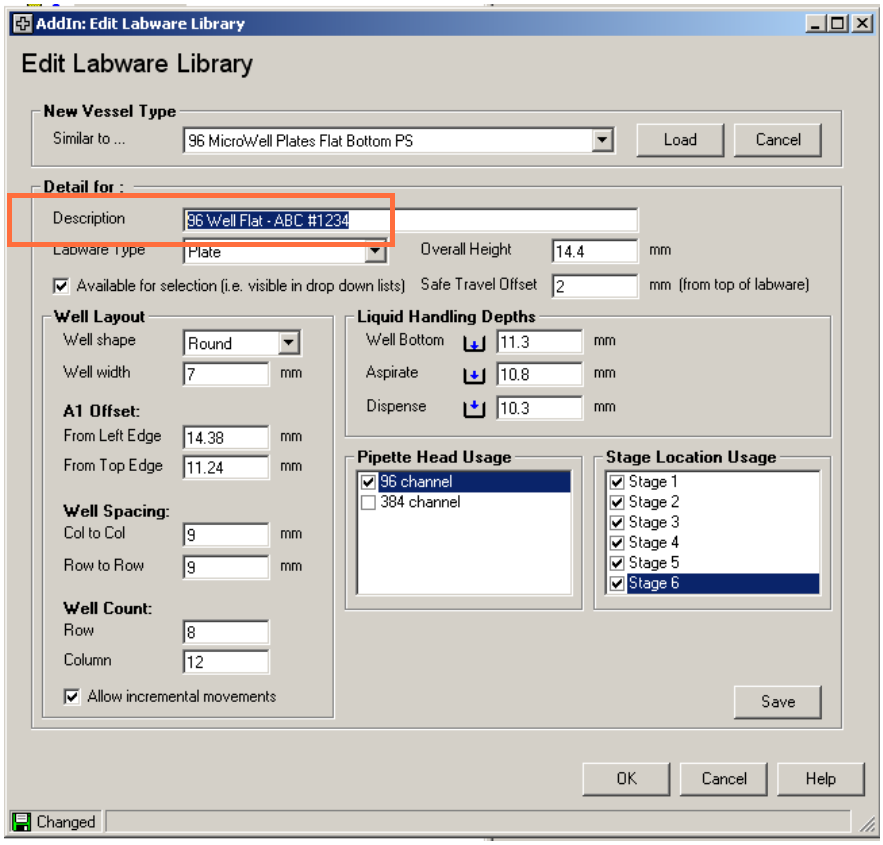
3. Select an existing vessel type that is similar to the plate type of vessel type that you want to enter. Click on the drop-down arrow in the Similar to… field and select the item which best corresponds to the custom item you want to enter. For this example, select the 96 MicroWell Plates Flat Bottom PS.



4. Click the Load button. This will load all the existing information for the similar plate you have chosen and you can simply edit over the details which don't match.

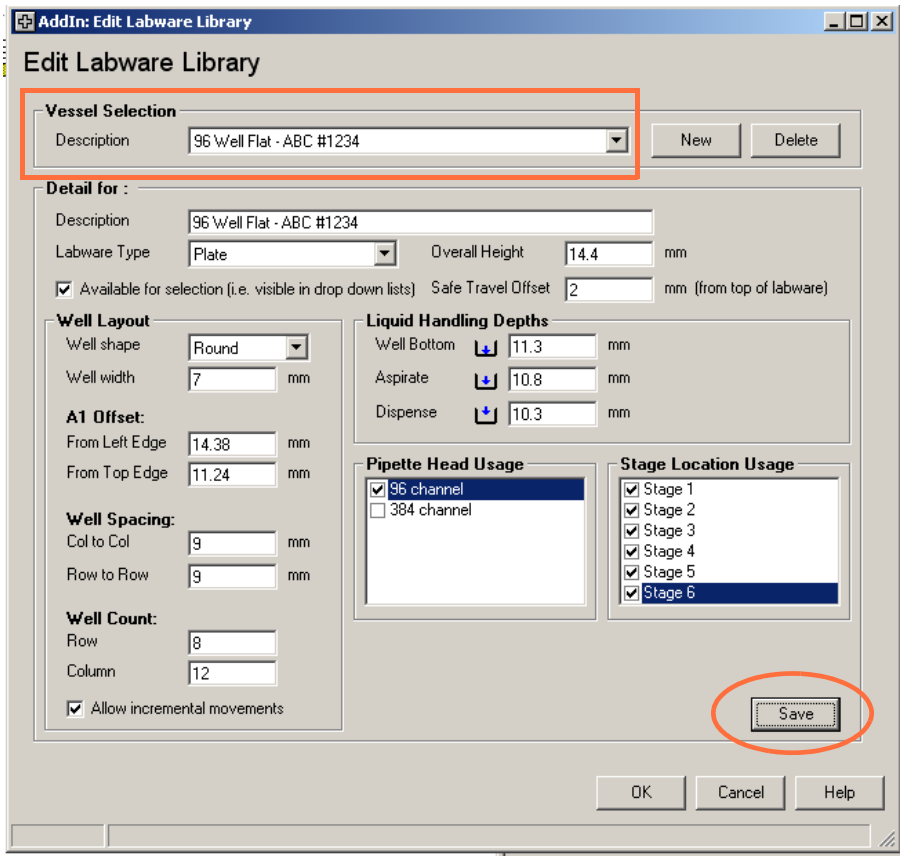
5. In the Detail For section, type in the name of the plate that you want to use in the Description field. Be sure to make it something you would recognize, for example; plate type, name brand of the product, catalog number of the product, or something specific related to your protocol that is easily identifiable.

   For this example, rename the description to a 96 well flat from ABC Company with part number 1234 or "96 Well Flat - ABC #1234". Once you've established a name you can now go through the remaining fields and change the corresponding information as appropriate. In this case, because it is a similar 96 well plate to one that was currently in the labware library, you may not need to change any fields.

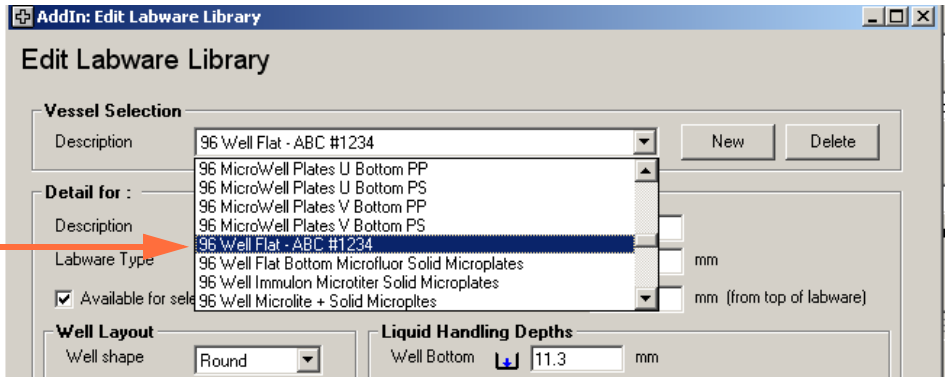


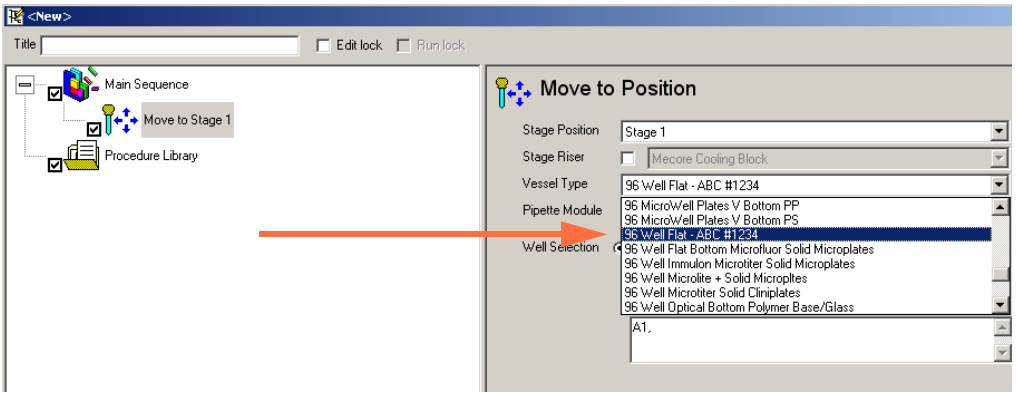
Remember that if you want this plate type to be available on the drop-down list to select for protocols, ensure that the checkbox next to Available for selection in the Detail For section is checked.

6. Typically you would edit the remaining specification for the appropriate fields. However, in this example you are just changing the name of the labware item so no additional changes are necessary. However, if you needed to change and dimension or parameters now would be the time. Once you have renamed the plate, click Save.



7. Once the plate type is saved, your new item will now appear in the drop-down menu on the description field in the Edit labware Library (for future editing) and within the Move To Position to select your new vessel type from the Labware Library.



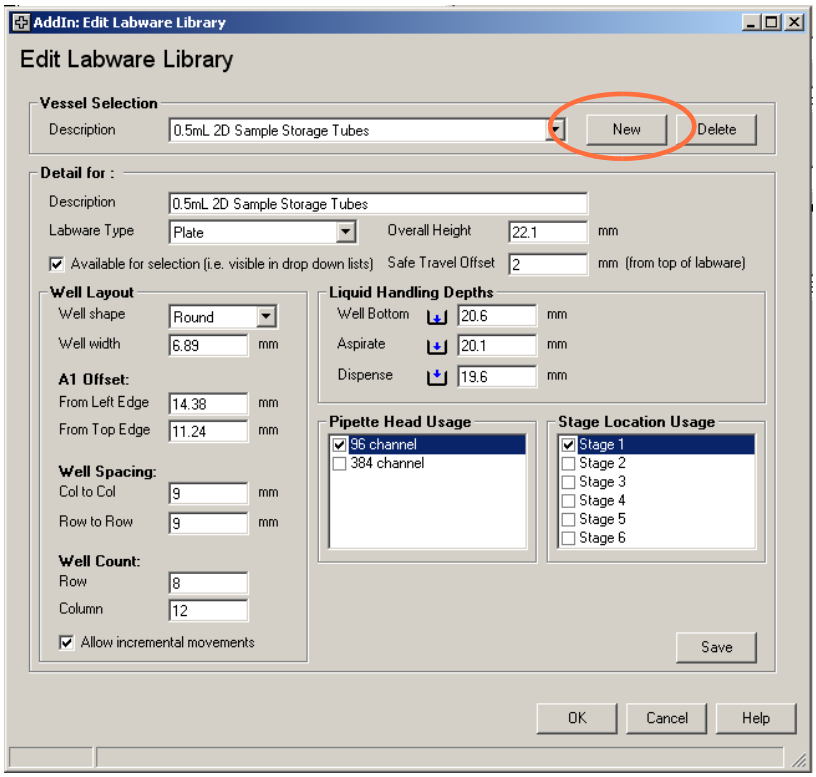


Note! If you currently had a sequence open with the Move To Position step accessible, the labware item that was just saved in the Labware Editor may not appear in the drop down list. Refresh the list by closing the Move to Position step and reopening it.▲

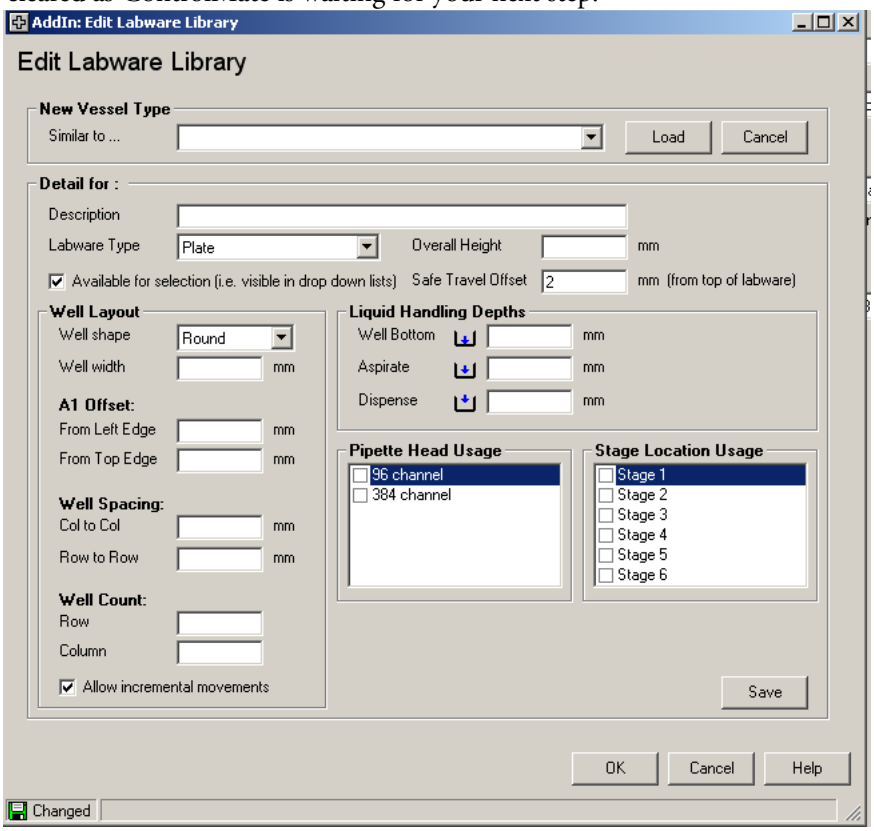
Entering New/Custom Labware

To enter a new/custom piece of labware, you can either select a similar labware item from the existing drop down list and overwrite the information or start with a clean set of empty fields to enter in new dimension parameters. For this example, enter in a new set of dimension parameters.

1. Click on the New button.

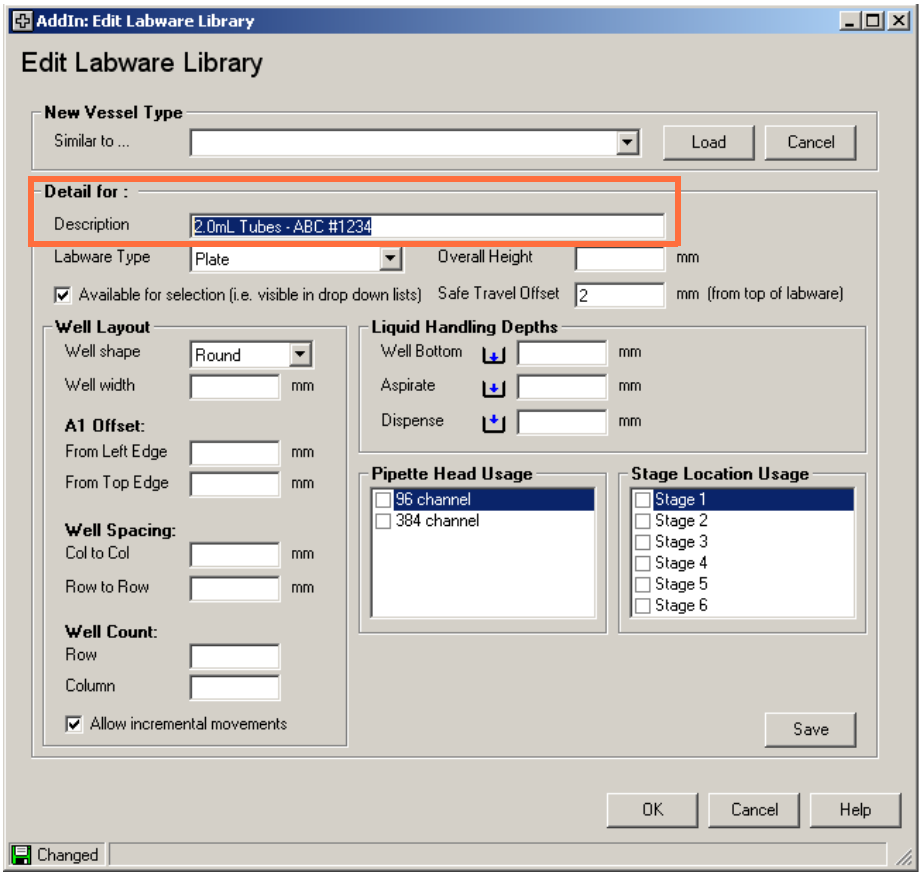


2. An Edit Labware Library screen appears to enter in a new vessel type. All the fields are cleared as ControlMate is waiting for your next step.



3. Since you are entering a custom piece of labware from scratch, theoretically there is no template or similar piece of labware to prefill in the fields. Skip selecting the Similar To… as you have nothing to pre-load. None of the fields will pre-fill as you have not selected something similar to what you're using. So in this case, you would have to enter in all the fields as appropriate.

4. In the Detail For section, type in the name of the plate that you want to use in the Description field. Be sure to make it something you would recognize, for example; plate type, name brand of the product, catalog number of the product, or something specific related to your protocol that is easily identifiable. For this example, type the description as 2.0mL Tubes from ABC Company with part number 1234 or "2.0mL Tubes - ABC #1234".



5. If you have a manufacturers spec sheet entering the information will be very simple as you would be taking the dimensions directly from the document and entering them into the appropriate fields. However, without the manufacturers spec sheet you will need a set of calipers to begin taking the necessary measurements to fill in all appropriate fields. See examples of these tools below:

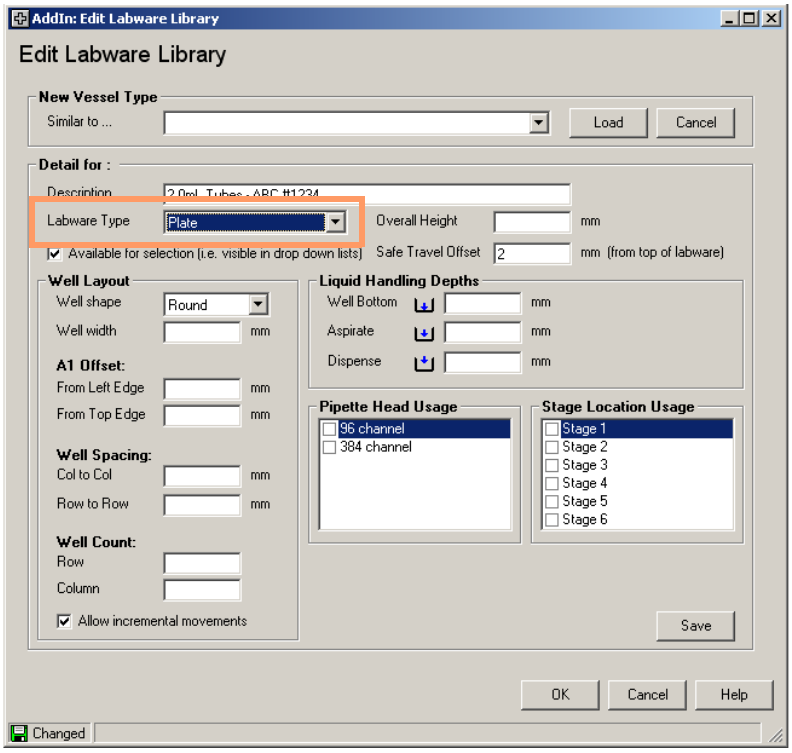
Manufacturer's Specification Sheet

CATALOG NUMBER	SEE BELOW	
WORKING RANGE. (µL)	50 – 250 µL/WELL	
MATERIAL	PS	
	MM	INCH
A, BASE LENGTH	127,7	5,03
B, BASE WIDTH	85,5	3,37
C, TOP LENGTH	123,3	4,85
D, TOP WIDTH	81,2	3,2
E, FLANGE LONG SIDE	7,5	0,30
F, OVERALL HEIGHT	14,4	0,60
G1, DIA TOP	Ø7,1	Ø0,28
G2, DIA BOTTOM	Ø6,4	Ø0,25
H, A - I LOCATION (X)	14,3	0,56
J, A - I LOCATION (Y)	11,3	0,45
K, WELL TOWELL SPACING	9	0,35
L, WELL DEPTH	10,2	0,40
M, BOTTOM OF WELL DISTANCE	4,5	0,18
N, FLANGE SHORT SIDE	2,4	0,09
***P**, LID LENGTH	127,4	5,04
***Q**, LID WIDTH	85,4	3,36
***R**, LID HEIGHT	9	0,35
S, STACKED HEIGHT – NO LID	27,3	1,08
***T**, STACKED HEIGHT W/LIDS	32,5	1,28
***U**, ASSEMBLY HEIGHT W/LID	16,3	0,64

CATALOG NO.	SURFACE	COLOR	STERILE	WITH LID*	UNITS PK/CASE
140761*	CELL CULTURE	CLEAR	+	-	1/50
163320*	CELL CULTURE	CLEAR	+	+	1/50
168136*	CELL CULTURE	CLEAR	+	+	10/100
262162	NON-TREATED	CLEAR	+	-	1/50
268152	NON-TREATED	CLEAR	-	-	10/100
268200	NON-TREATED	CLEAR	+	+	10/100
449824	MAXISORP	CLEAR	-	-	5/80
475434	POLYSORP	CLEAR	-	-	5/80

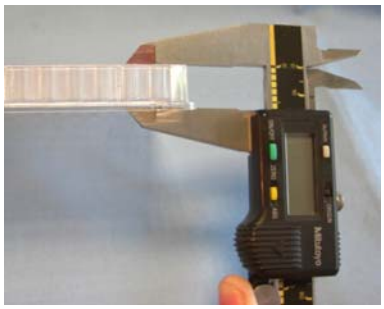
Digital Calipers

6. Under the Labware Type there are three valid elections to choose from within the drop-down menu: plate, reservoir, and tip wash. In this case the tubes in the rack are considered a plate.

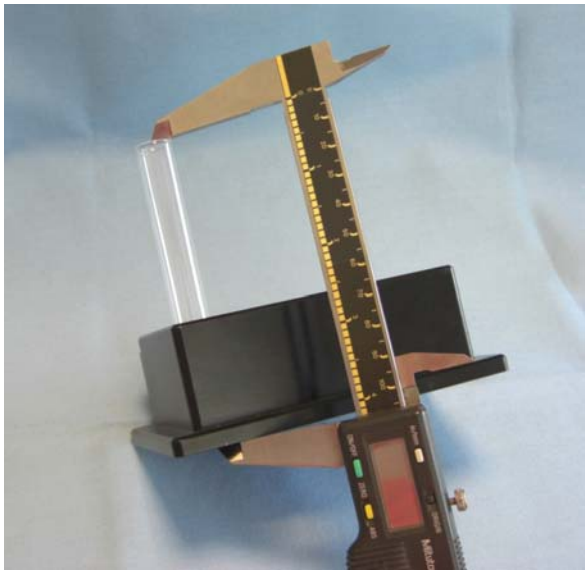


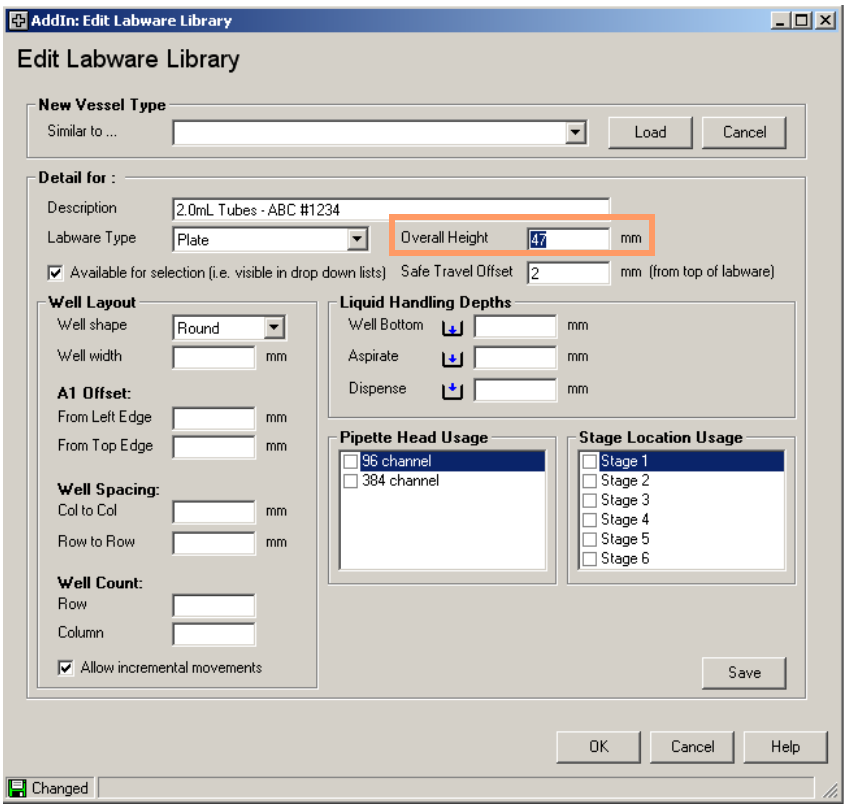
7. The Overall Height field is the total height of the custom labware item that will be set up on the stage; for example if you are just using a plate, the height would be measured from the bottom of the skirt to the well top. However, if you are using tubes / vials within a rack, you need to install a tube / vial in the rack first. The height is measured from the bottom of the rack to the top of the tube / vial.

Plate

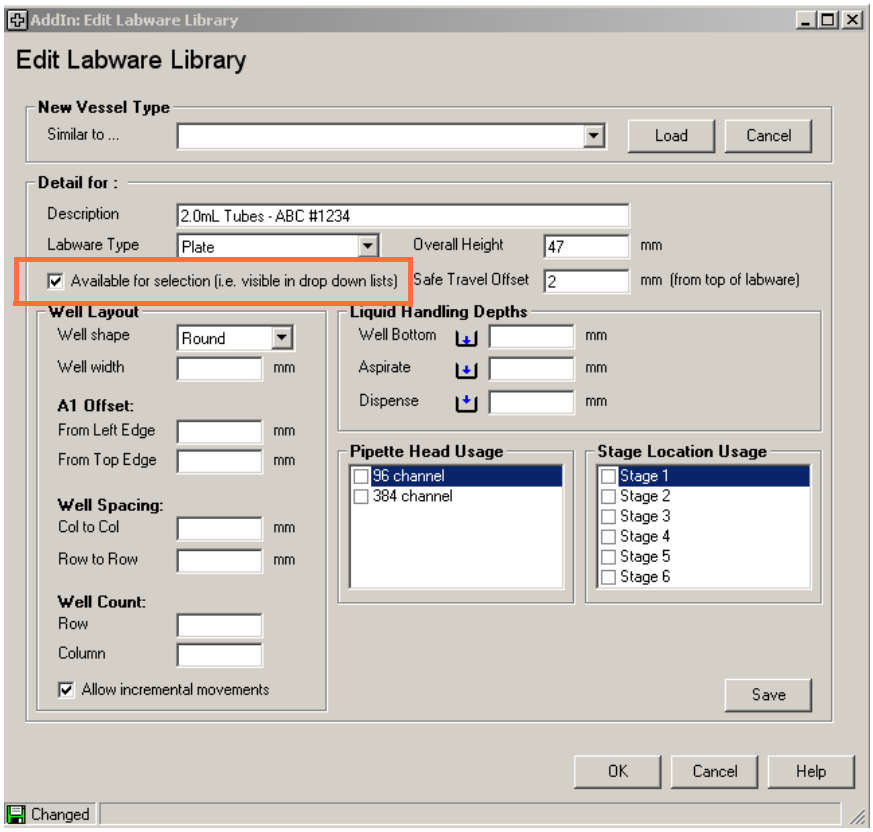


Tubes Installed in Rack

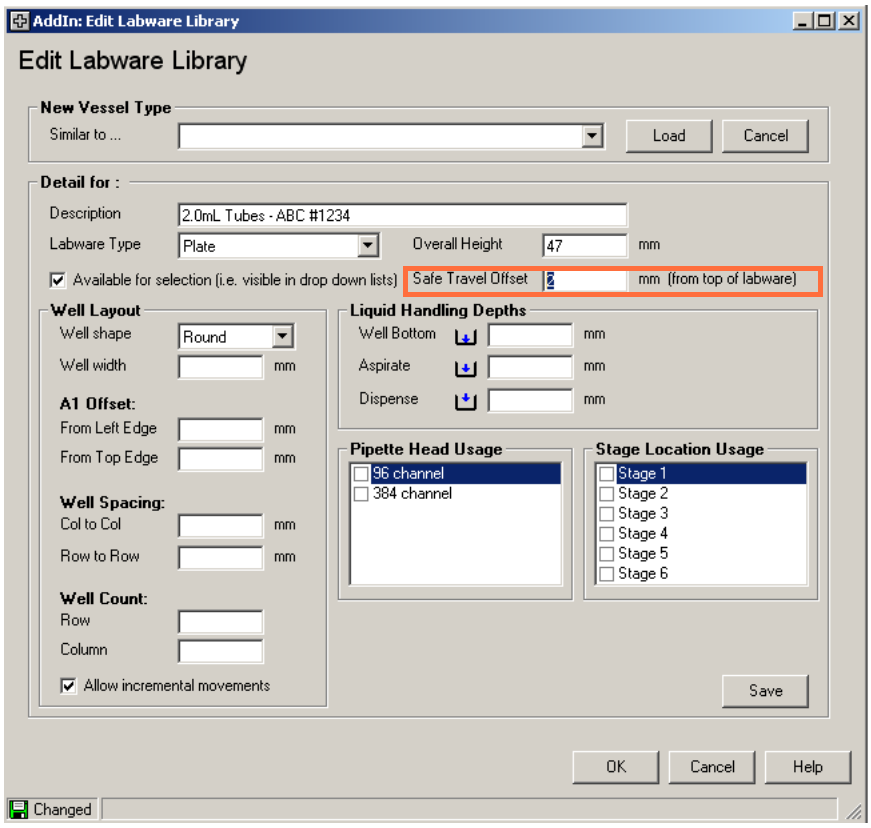




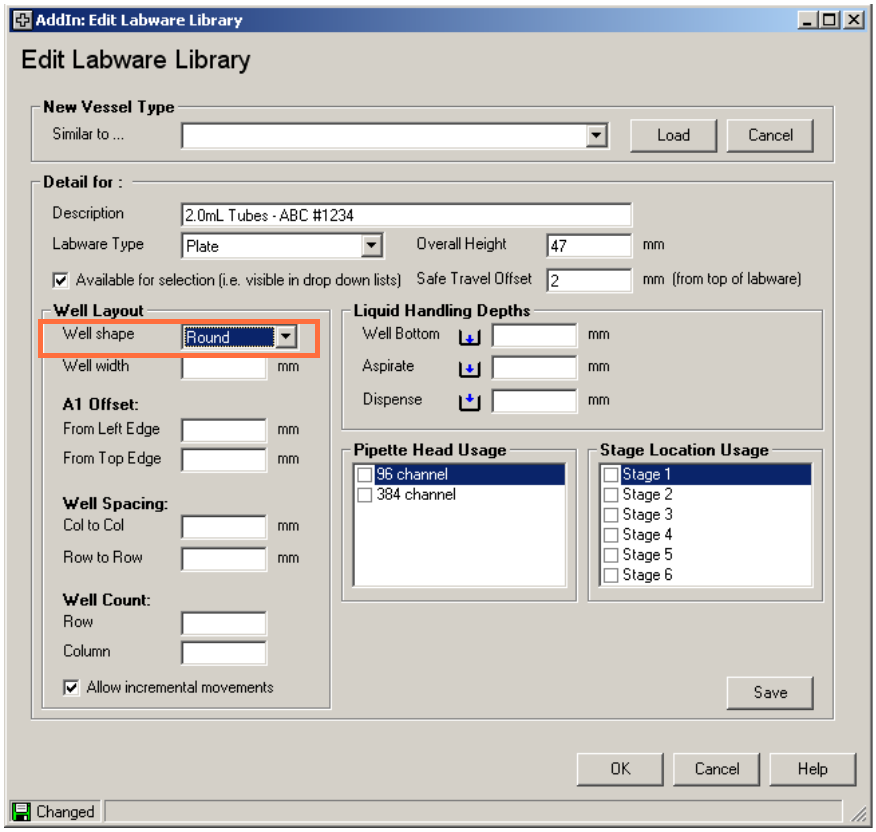
8. Remember that if you want this plate type to be available on the drop-down list to select for protocols, ensure that the checkbox next to "Available for selection..." in the Detail For section is checked.



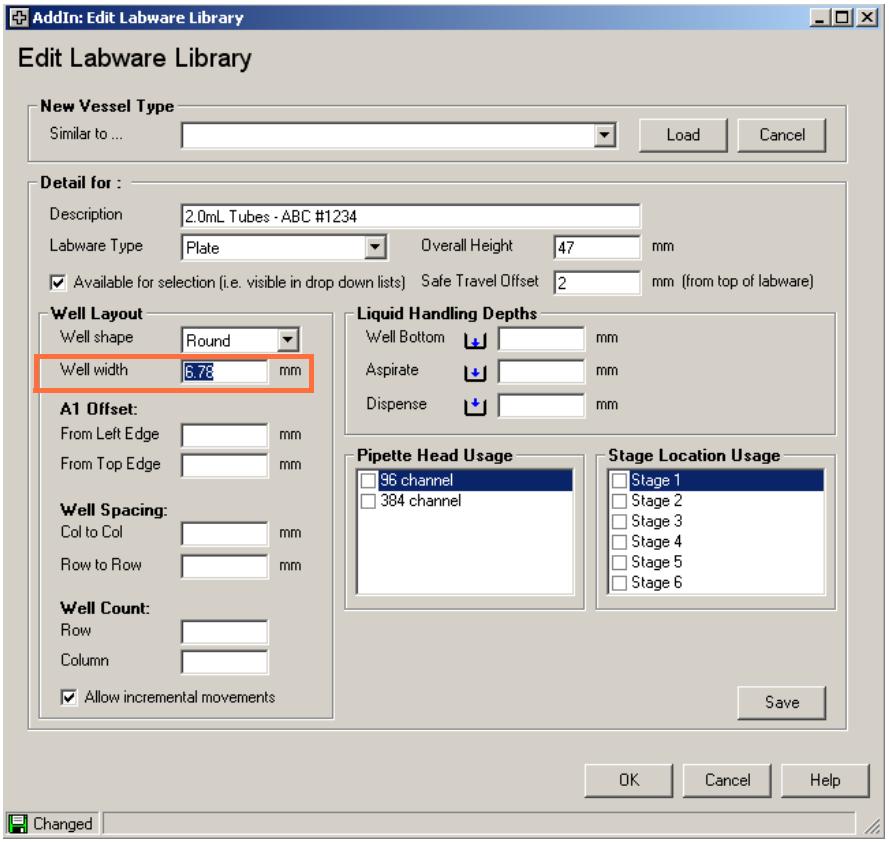
9. For the Safe Travel Offset field, leave the default of 2mm.



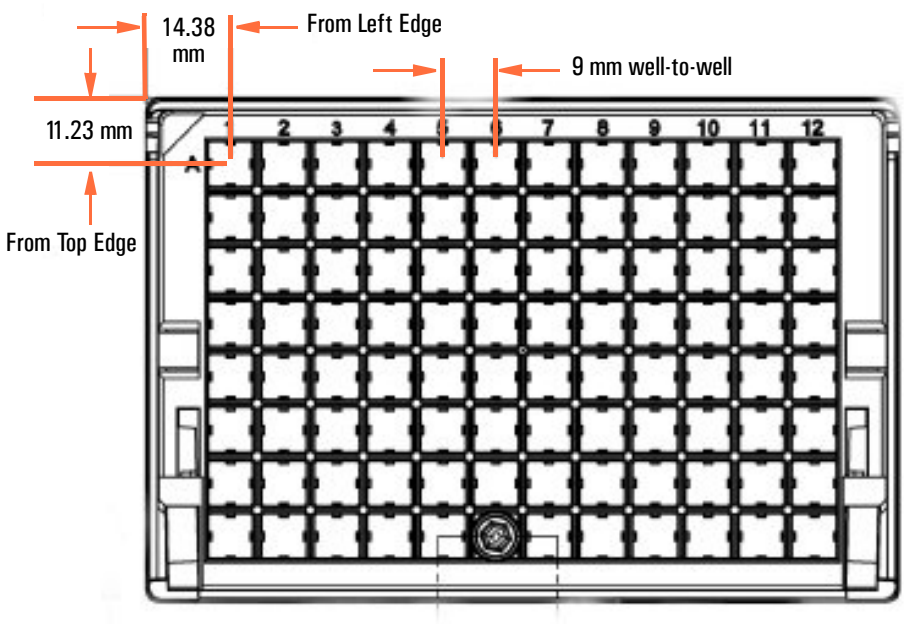
10. In the Well Layout section, enter the Well Shape of your item. From the drop-down menu you have three choices: round, square and not applicable. In this case the well layout is round.



11. Well Width can be measured from a plate well or in the case of using a rack with tubes / vials, you would measure the actual width of the tubes / vials as shown below.

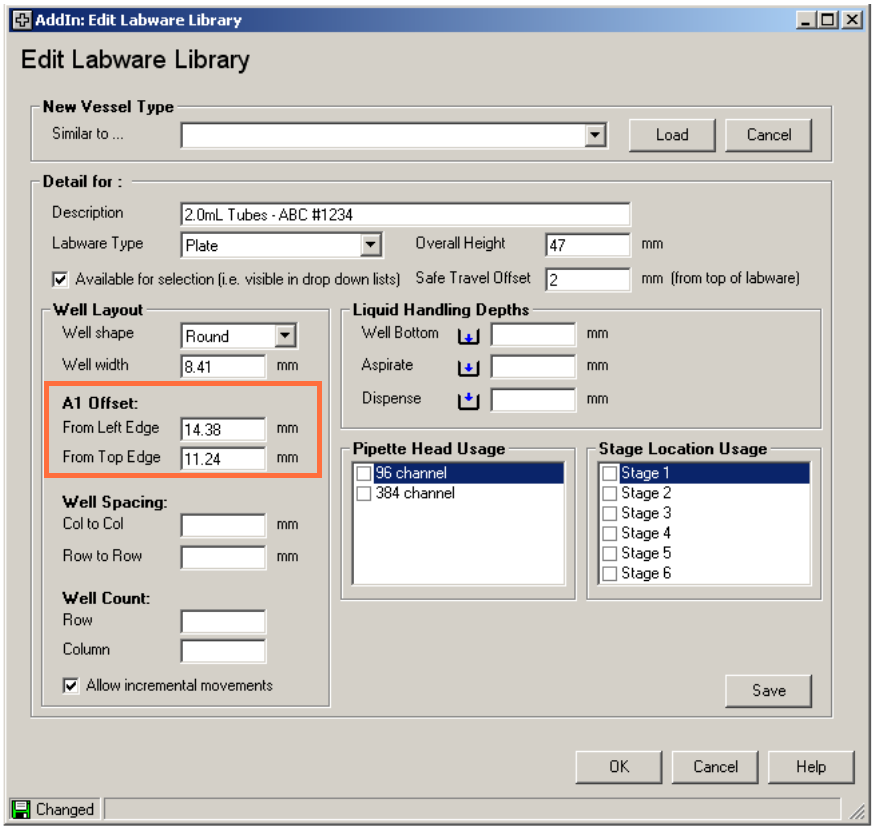


12. For the A1 Offset, measure the center of the A1 position of the well or tube/vial:
    a. From Left Edge: measurement of a plate from the left side of the plate into the center of the A1 well.
    b. From Top Edge: measuring into the A1 center well from the top edge of plate: default based on 96 well plate 11.23mm



Note! In places where you can't move equal distances across a plate, reservoir, using non conventional plates or labware with staggered wells (e.g. honeycomb, divided reservoirs) the tips won't line up properly to do custom incremental adjustments.▲

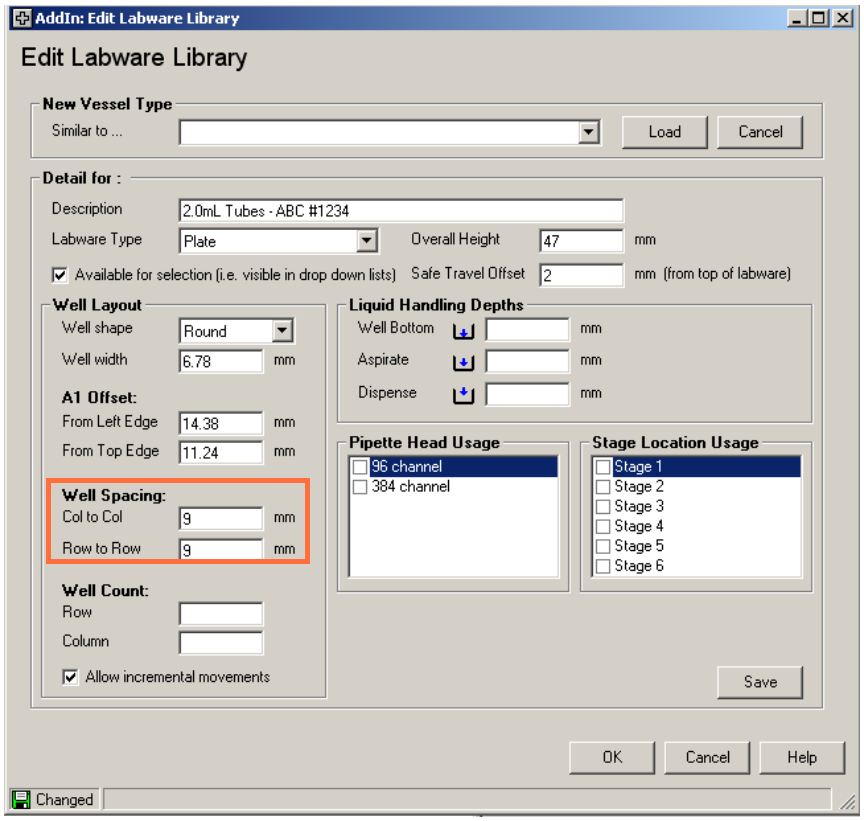
If you do this correctly, your tips will be perfectly centered in 96 and 384 formatted well plates, as well as, in the tubes/vials within a rack.



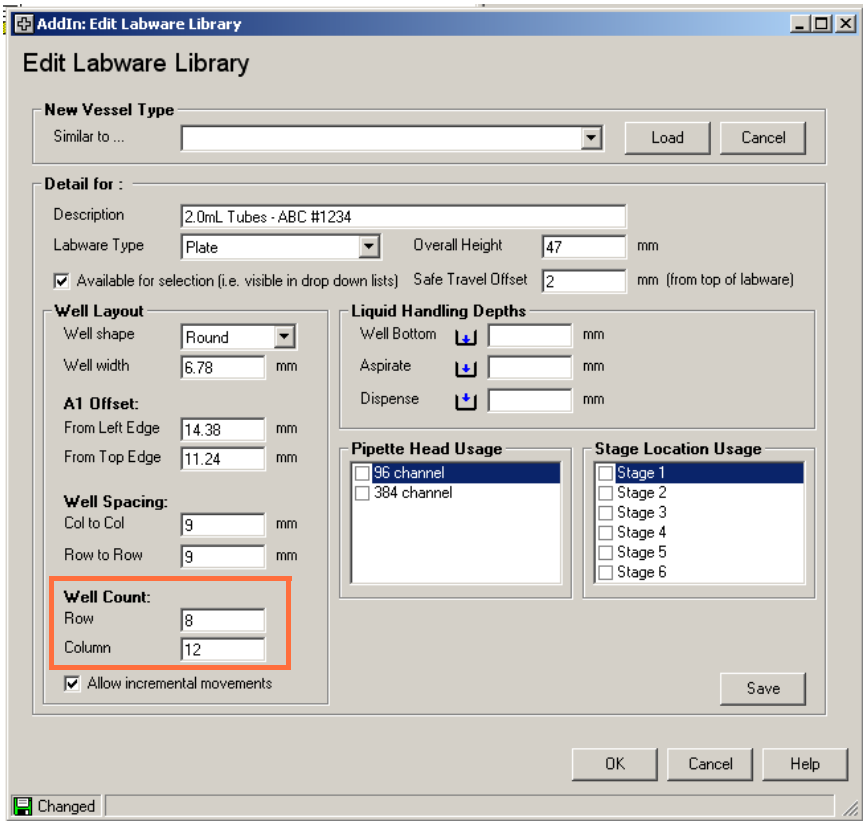
Note! On some labware, the bottom of the labware item might have the centered holes or indications imprinted so you can easily measure these dimensions. However, a manufacture's spec sheet would be ideal to gain the information for these two measurements.▲

Use the bottom of a labware item whenever possible, otherwise when setting up your labware in the editor you will have to make the necessary tweaking to get it perfectly aligned in the well centers, which is just time consuming but can be done just as accurately.

13. For Well Spacing, measure from column to column; this is from the center of the first column to the center of the column next to it. Now measure from row to row; this is from the center of the first row to the center of the next row.

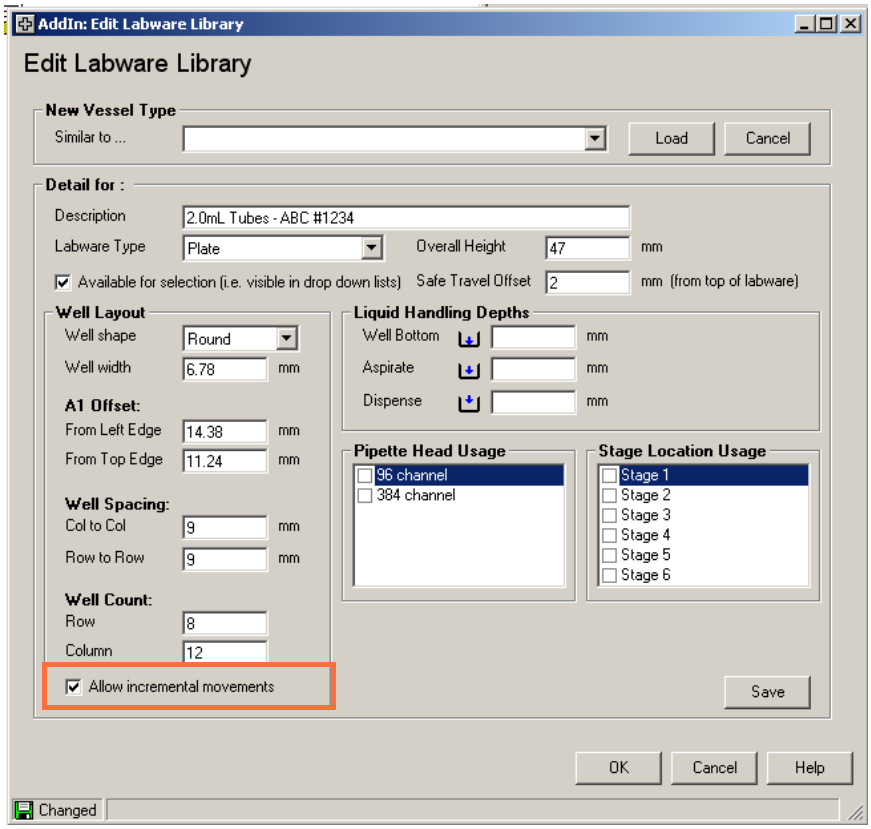


14. For the Well Count, enter the number of rows and columns across the plate.



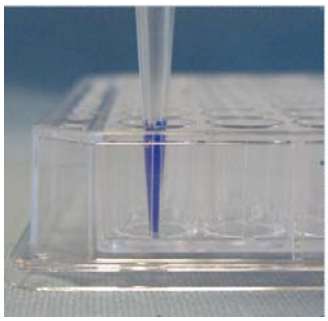
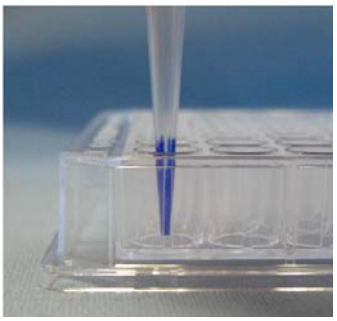
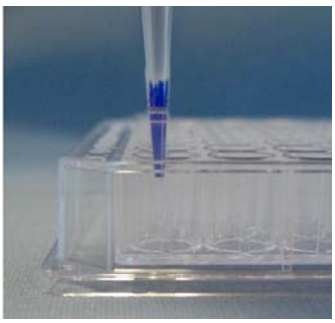
15. Select the check box if you want to “Allow Incremental Movements” across the labware item. This is beneficial when you want to do multi-dispensing or a serial dilution across a plate/rack.

    Note! There are some cases where you might not want to do incremental movements, so choose accordingly. For example, in places where you can't move equal distances across a plate, reservoir, using non conventional plates or labware with staggered wells (e.g. honeycomb, divided reservoirs) the tips won't line up properly to do custom incremental adjustments.▲



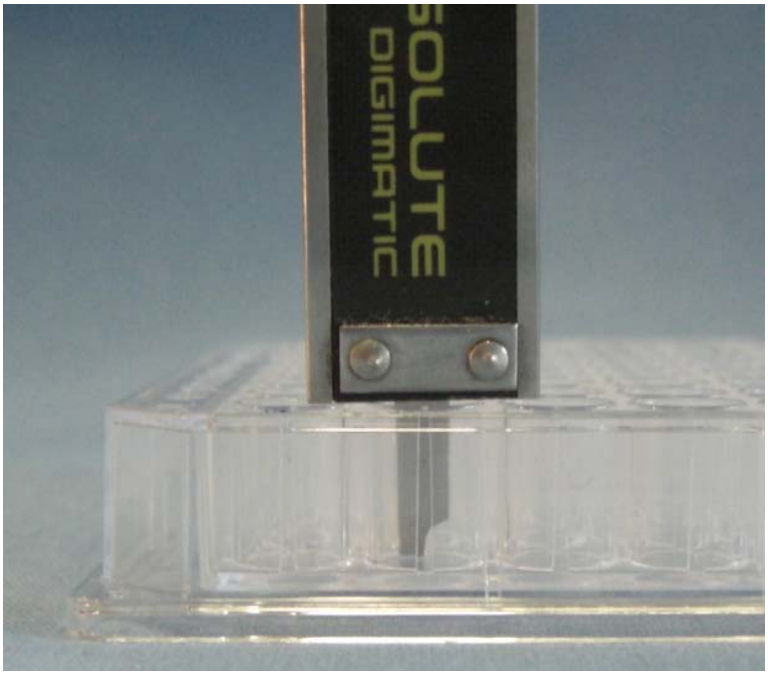
16. For the Liquid Handling Depths, there are three entries which need to be entered; well bottom height, aspirate height, and dispense height. Guidelines for entering measurements are as follows

Table 2.

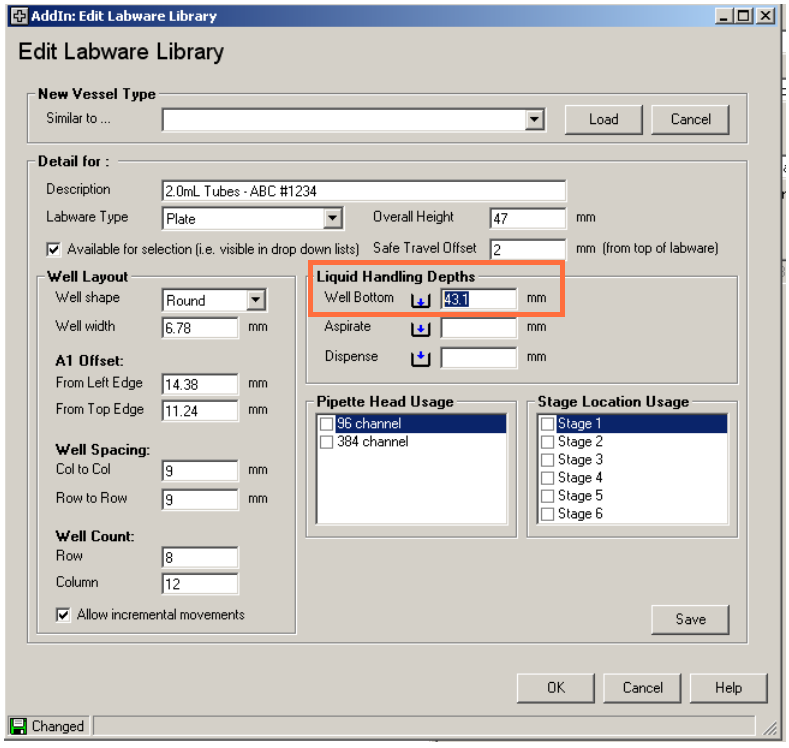
Well Bottom	Aspirate	Dispense
Tip touches well bottom	Tip is 0.5 mm off well bottom	Tip is 2.0 mm off below well top
		

Optimize the liquid handling depths (heights) for a sequence by adjusting this value to a more specific measurement to meet the needs of your application based on sample viscosity and the volume of the sample contained in the well. Raise or lower the tip the appropriate height within the well. Remember; when creating your measured values, the higher the number, the tip is positioned lower into the plate. The lower the number the tip is positioned higher in the plate.

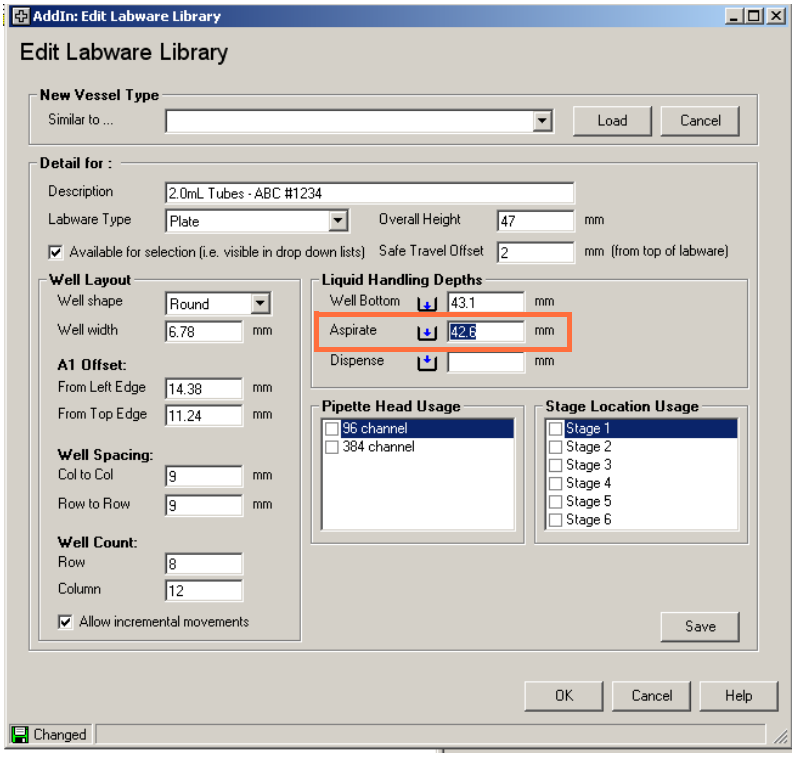
- Well Bottom - is typically the measurement of the actual bottom of the well. In most applications it may not be desirable to aspirate or dispense sample from the well bottom. This is because the tip cannot effectively create a vacuum to aspirate or dispense liquid if the tip is directly touching the well bottom. If you try to aspirate from the well bottom, no liquid would appear to go up into the tip until the tip starts to move out of the well, and then liquid could jump up quickly in the tip causing an air column in the tip or bubbles in the liquid. If you try to dispense from the well bottom, no liquid would appear to be dispensed into the well until the tip starts to move out of the well, and then it could create frothing, splashing or bubbles. In both cases, an accurate sample may not be aspirated or dispensed. So you would need to determine if you want to actually be touching the well bottom or making an adjustment to have it very close, but not touching.



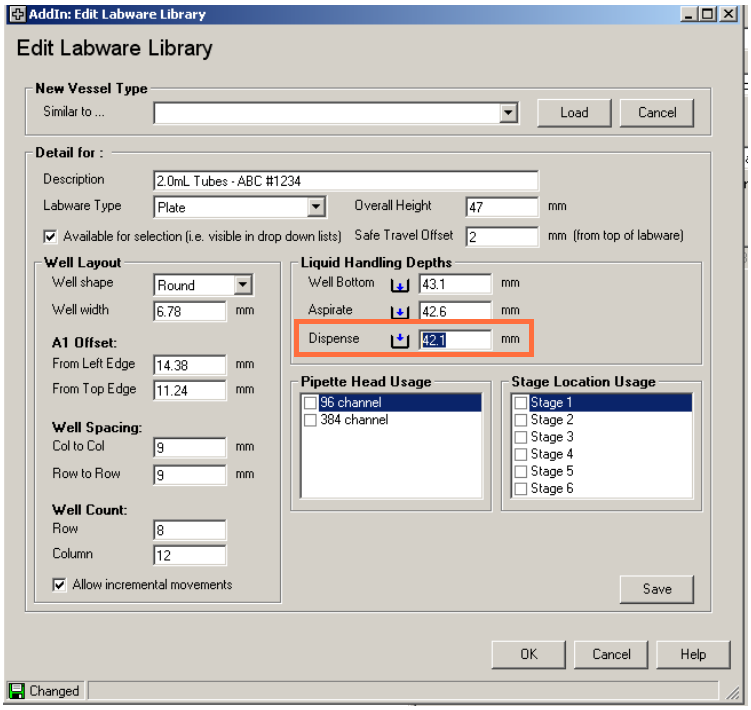
To measure the well bottom, make sure you have a set of calipers that can measure the depth. Insert the depth measuring end as shown and ensure this end touches the exact bottom of the well. Record your measurement in the Well Bottom field.



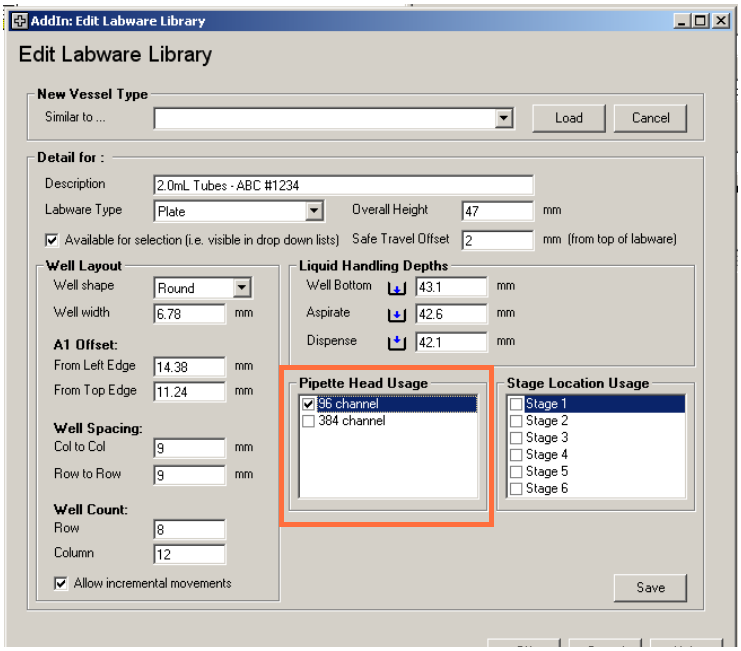
- Aspirate - aspirate height is typically entered as an 2 mm above the well bottom. This is to ensure that you are far enough into the well to aspirate liquid, but not touching the well bottom.



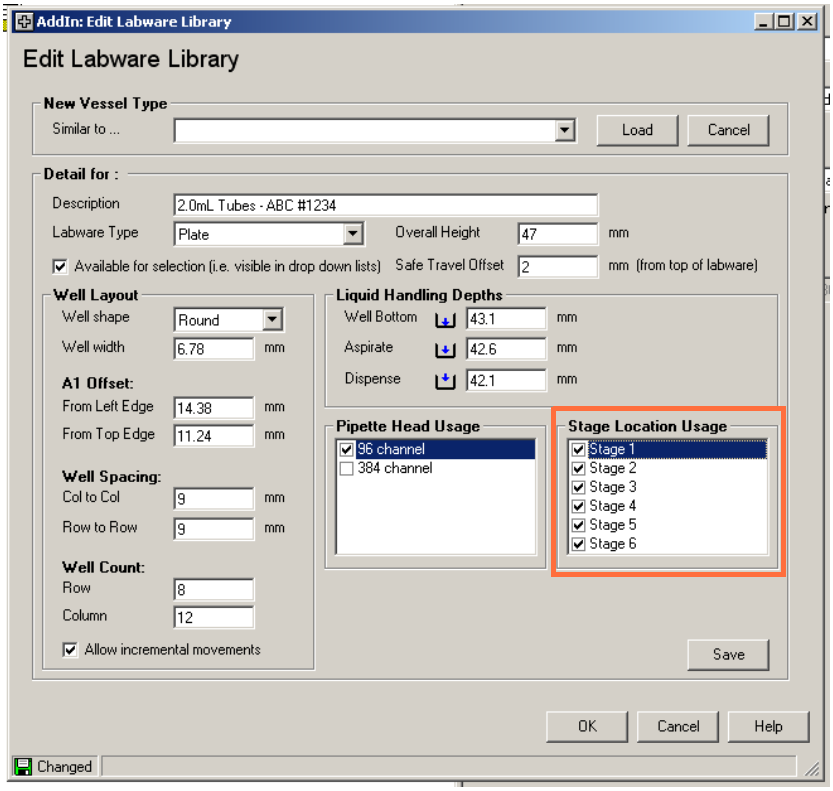
- Dispense - dispense height is typically entered 2 mm below the well top but may be adjusted to prevent splashing, etc., depending on the dispense volume and fluid properties This is to ensure that you are deep enough into the well to dispense liquid, but slightly higher from the aspirate height.



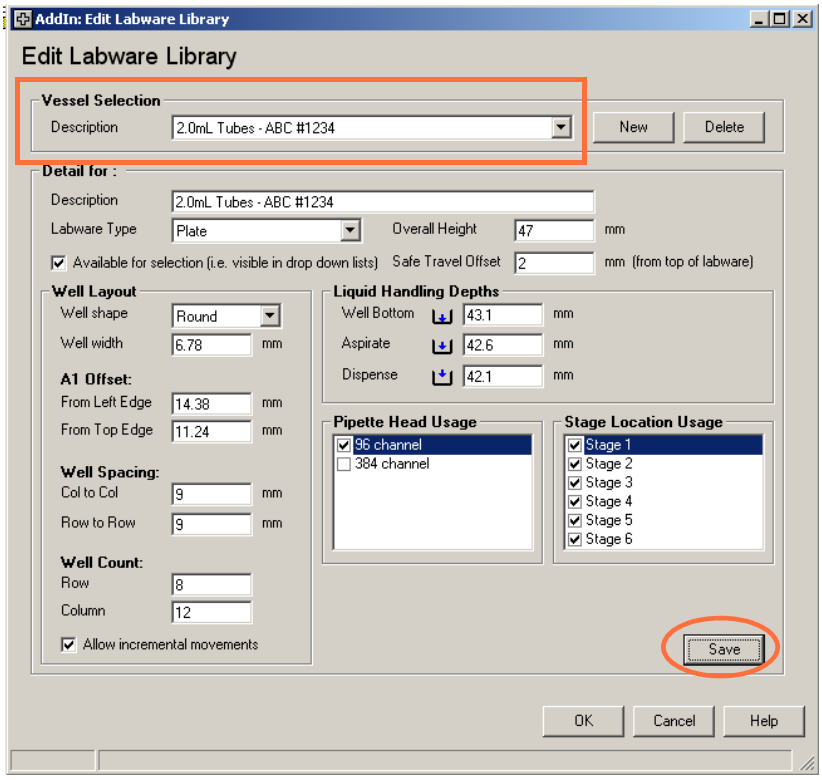
17. Under the Pipette Head Usage section you will need to verify and select which pipetting heads can be used with your labware. Simply check the appropriate boxes by selecting and deselecting the check boxes accordingly.



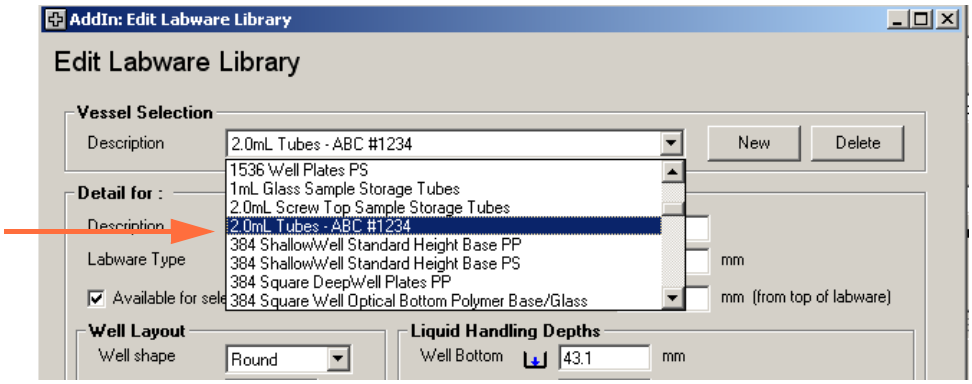
18. Under the Stage Location Usage section you need to identify which stages the labware item is compatible. With taller labware items these might be restricted to the lower stages in locations 1 and 2. For standard height or shorter labware items, you could use any of the stage locations 1 - 6.

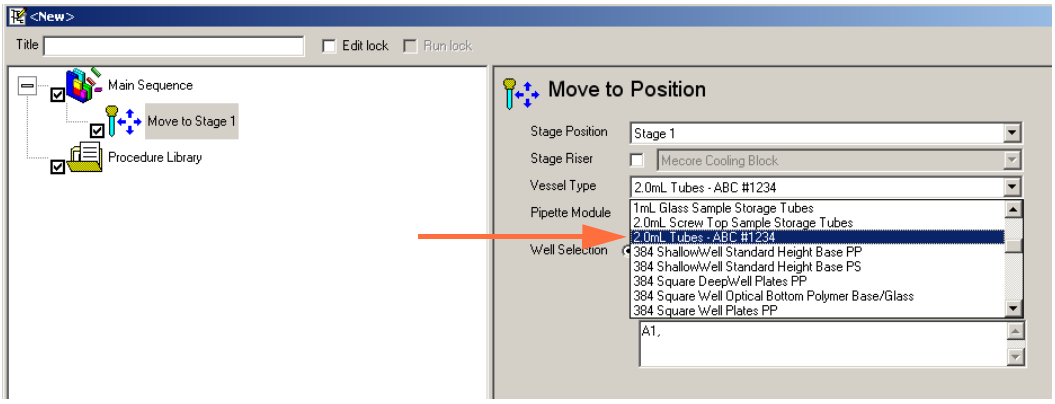


19. Next you need to save the plate type. Once the plate type is saved, the item description field will pre-fill with the labware description that was just created.



20. Your new item now appears in the drop-down menu on the description field in the Edit labware Library (for future editing) and within the Move To Position to select your new vessel type from the Labware Library.

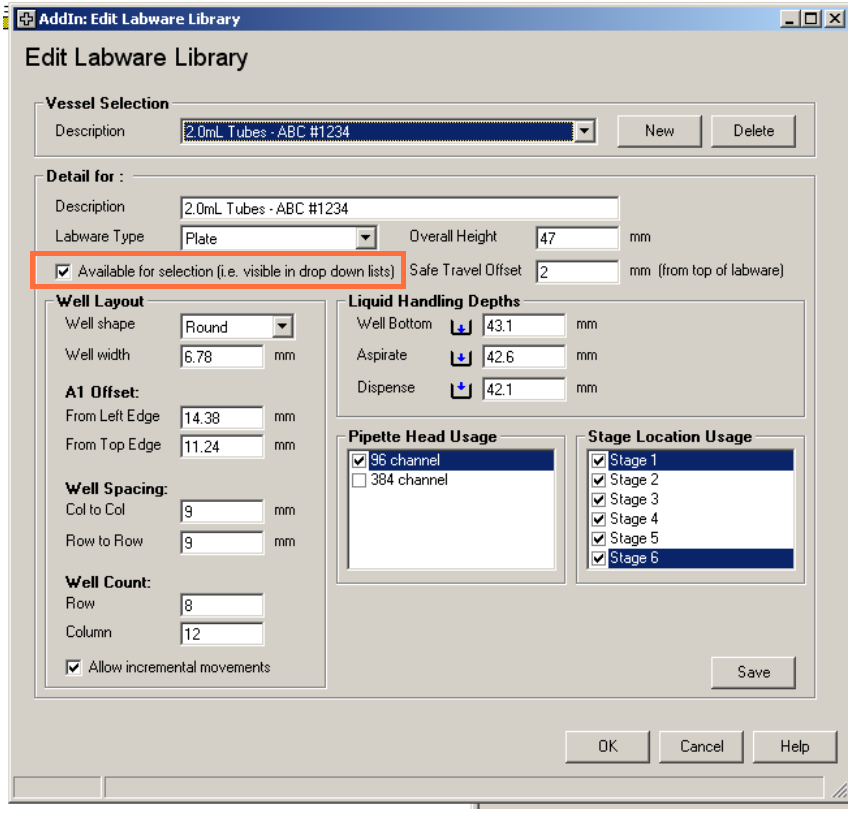




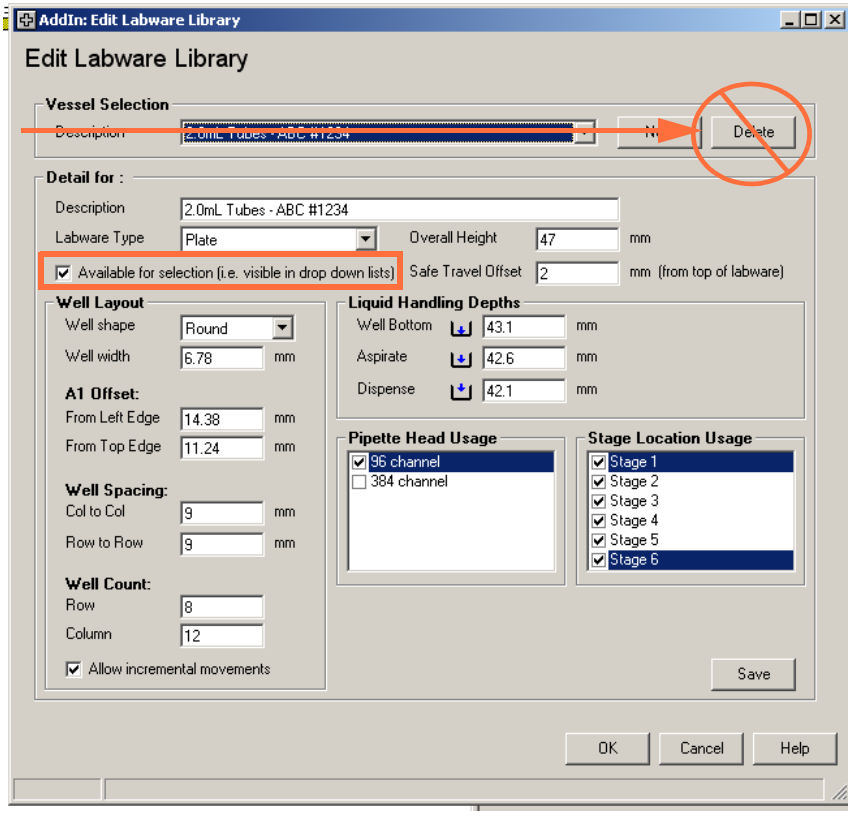
Note! If you currently had a sequence open with the Move To Position step accessible, the labware item that was just saved in the Labware Editor may not appear in the drop down list. Refresh the list by closing the Move to Position step and reopening it.▲

General Guidelines

Remember when adding items in the labware library; make sure your new entry is available for viewing from the drop down list to select for your protocols. The only time you would choose to uncheck this box is if you would like to only show your custom labware additions or selected labware items commonly used to the drop down list. This comes in handy when writing protocols and you only want to choose from a select number of labware items. Instead of having the original default 50+ items listed, you can choose to only have the items you select to limit the amount of time scrolling through the list.



However you do have an alternate option to limit the amount of items in the drop-down menu in the labware library. When you are in the edit labware library window, any existing pre-loaded labware can be selected from the drop-down menu. Once an item is selected, next to the description field you'll see a delete button. From here you can remove any labware from the pre-loaded default list by clicking on the delete button.



CAUTION Use extreme caution in selecting and deleting labware items from the default drop down menu in the Edit Labware Library section. Once the item is deleted it cannot be recovered. This is why the “available for selection” checkbox was placed into the edit labware library as simply selecting and deselecting this box for certain labware items can customize your drop down list for your needs. By using this checkbox option, you can bring labware items back into view at any time as needed.▲

Creating Pipetting Programs

A pipetting program is a sequence of pipetting actions that accomplishes a pipetting task. In the ControlMate software, the pipetting program is called a sequence file. Separate sequence files can be created for a number of different processes, including serial dilutions, plate-to-plate transfers, and simple dispensing operations. Once created and saved, the sequence files can be quickly retrieved for use. The following pages describe each command and provides example sequences to work through to better understand the creation and use of sequences. Consult with Thermo Fischer Scientific for assistance with your specific requirements.

IMPORTANT Due to stage/head configuration limitations, serial dilutions can be performed as follows:
Column-wise: Stage 3 or Stage 4
Row-wise: Stage 3 or Stage 5

3	1	5
4	2	6

Stage Positions

Protective covers removed to show stage layout
Actual stage design may vary from that shown

Creating Sequences

The main function of the ***ControlMate*** software is to create sequences of commands, often called 'programs' or protocols to aspirate and dispense fluid. (Refer to the "Sample Pipetting Sequences" section of this manual for examples of various complete sequences and 'tutorial-steps' explaining how to create the sample sequences.) The software also contains a variety of tools and 'Add-ins' which are used to perform basic functions such as calibrating the motion coordinates in a ***Versette*** system.

A sequence typically consists of moving to a fluid source location on a stage, aspirating the fluid, then moving to another location to dispense some or all of the fluid. Most sequences can appear quite complex due to the many options for labware, aspiration, dispense, pipette types, delays, and other system variables. ***ControlMate*** provides a visual method to create sequences and provides a validation routine that automatically checks sequences for any setup/programming errors.

Getting Started

Pipetting programs are created in ***ControlMate*** by selecting "File" "Create New Sequence" (or pressing the key combination CTRL+ N, or clicking the "New Sequence" icon). You can view and select the list of program commands (also referred to as steps) by clicking the "Add Command" drop-down menu, or selecting commands from the Toolbox icons. Each time you click an icon, that icon's command is added to the sequence tree. Each command typically has a variety of options that must be set for proper operation. For example, select a stage or a vessel type, or the starting position or volume or speedthen clicking icons in the Toolbox to add commands to the sequence. Each icon is detailed in the following pages.

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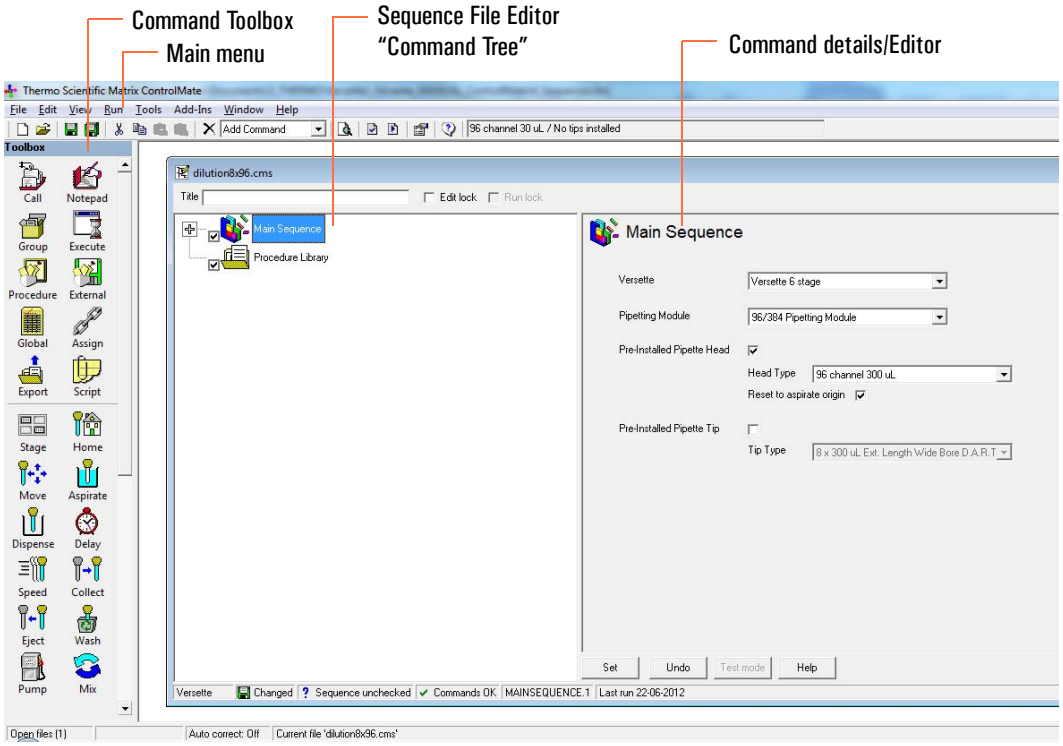
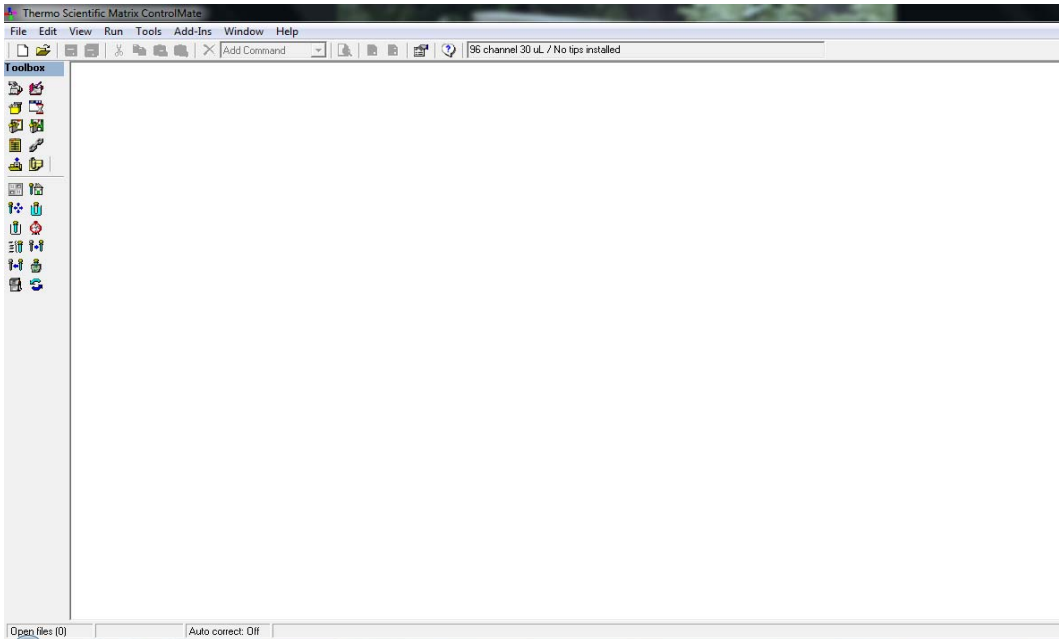
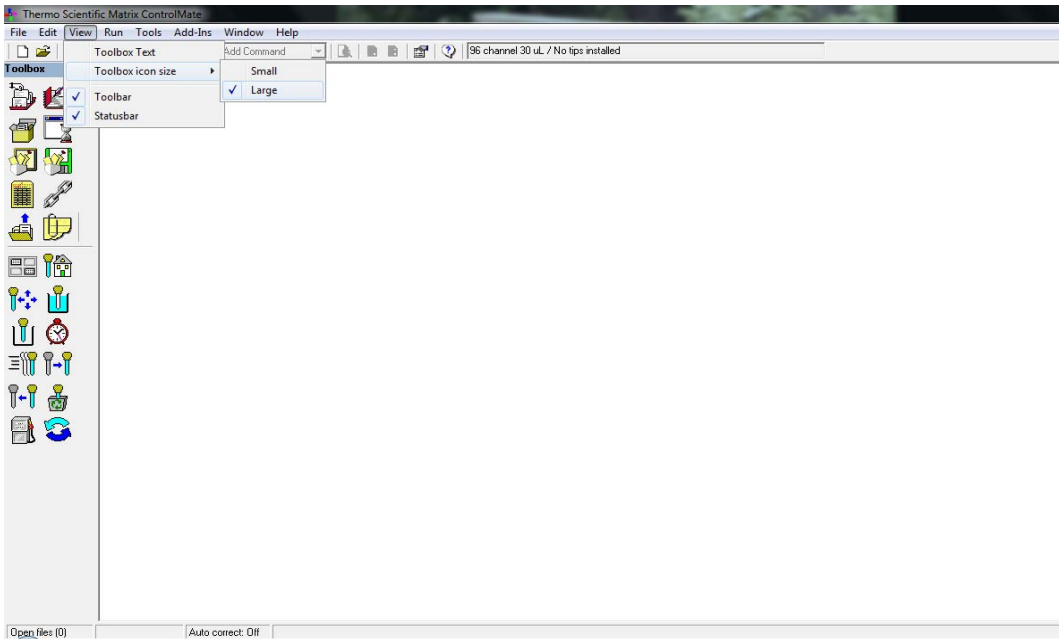


Command Icon Options

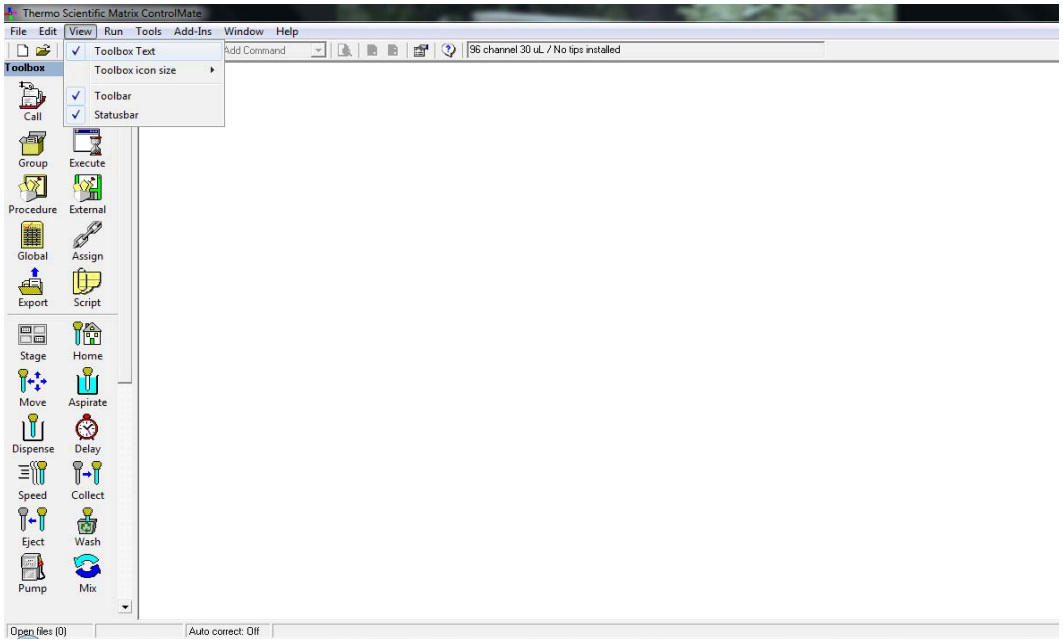
By default, command icons are displayed on the left side of the screen, as shown:



Select "**View**", "**Toolbox icon size**" then "**Large**" to increase the size of the icons.



If desired, select "**View**", "**Toolbox Text**" to display text labels beneath each icon.



Commands: Summary

Commands are summarized in the following table. Refer to the ***Versette User Manual*** for details on system operation. Refer to the following pages for specific details on each command.

Table 3. Commands

Icon	Command Name	Purpose/Usage
	Home axes	Resets all stage and head motors to their home positions. This is typically performed upon system startup or following the installation of a pipetting head. If desired, you can use this command to Home all axes to ensure all motions are highly accurate.
	Speed Control	Adjusts speed (aspiration or dispensing speed), horizontal and vertical stage speeds, etc.
	Move	Move a stage or pipetting head, or both. For example, a stage must be moved under the pipetting tips prior to the Aspirate or Dispense command.
	Collect pipette tip(s)	This command will pause the system and wait for the user to load tips. See the Eject pipette tips command below. Also, refer to the ***Versette User Manual*** for instructions to load or unload pipette tips.
	Eject pipette tip(s)	This command will pause the system to prompt the user to remove the pipette tips, as may be required to change tips at the end of processing. Depending on system software versions, a message may be displayed to prompt the user, or an external call can be made to a program such as Windows Paint to display a user-selected graphic to display. Refer to the ***Versette User Manual*** for instructions to load and unload pipettes.
	Aspirate	Aspirates a measured volume. Typically preceded by a move command.
	Dispense	Dispenses a specific volume or all of the liquid in the tips, with or without blowout. Typically be preceded by a move command.
	Delay	Inserts a pause into a program to stop processing according to the pause parameters. Once the continue condition has been reached, the program continues to the next step within the sequence.

Table 3. Commands

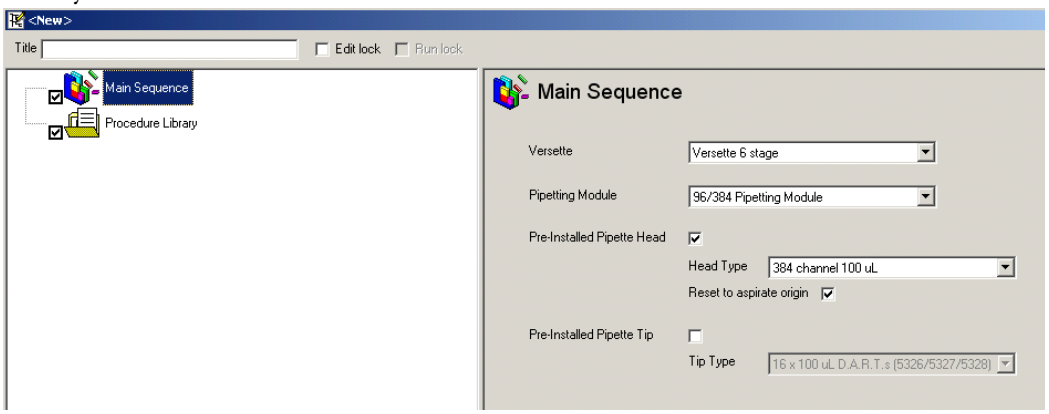
Icon	Command Name	Purpose/Usage
	Mix	Aspirates and dispenses a measured volume in specified cycles to mix content of the well in a microplate. Should be preceded by a move command.
	Pump	Controls pump speed and settings.
	Wash Tips	Washes inside and outside of pipette tips. Requires tip wash station and/or automated wash reservoir.
	Stage Map	Allows the user to set the default heights for all stage positions by specifying the labware layout at the start of the run. (Move commands specifying labware other than those in the stage map will cause the labware in the stage map to be overwritten.) The Stage Map command is typically used for serial dilution protocols. This is so the machine knows which type of labware is present on a specific stage position on the deck so the pipetting head will not crash into a stage position that might have a taller piece of labware present.
	Call Procedure	Calls a procedure either from within the current sequence file or from another sequence file. Saves time by reusing an existing procedure that has been previously saved.
	Notepad	Creates a note in the sequence file. Useful for documenting the steps in the sequence and for reminders during the pipetting procedure.
	Group Commands	Groups together commands for a common purpose. For example, the commands used to perform a common mix procedure can be grouped together. See the sample programs for examples on the use of groups.
	Execute External Application	Launches an external application. For example, launch the Windows Paint program to display a graphic on the screen to alert the user when a step is completed, or prompt the user to take an action. You could also launch a sound file using this command.

Table 3. Commands

Icon	Command Name	Purpose/Usage
	Procedure	A procedure is a series of commands that are 'grouped' and included in a program listing. The main program can make a special call to a sub-procedure to execute the sub procedure commands. The procedure could be a standard pipetting sequence that is routinely re-used in a program. Instead of copying and pasting multiple copies of the various steps, a call to run the 'procedure', can be done multiple times. For example, a main program might call a procedure that contains a move/aspirate/move/dispense steps, multiple times throughout the program. Examples are provided in the following pages for use of the Procedure command.
	Execute External Procedure	Execute a sequence that has been stored. A sequence could be a complete serial dilute program, for example, or a wash sequence, or any sequence of commands that can be re-used and called by another program.
	Global Value	Global Values allow simple input and re-use throughout a sequence of a numeric, text, or other value, in multiple locations. Use of globals values is a two-step process: 1. Define a Global Value 2. Assign a Global Value (set a value for the Global Value) For example, if a global value of 20 µl is set for dispense volume, and this global value is referenced a number of times throughout the protocol, each time the dispense volume is run, the value of 20 µl will be used. This can allow a quick change of a complex protocol: by changing the global value assignment to say, 30 µl, all subsequent runs of the protocol will use the new value. Global values save time by eliminating the need to edit a value or other entry in multiple locations in a protocol. Examples are provided in the following pages and in the pipetting samples section of this manual.
	Assign Global Value	
	Export Global Value	This command is used to extract information held in global values into external text based files. The usage of the command is not just to build files used for importing into external databases but could also be used for example to generate reports, for example by creating HTML based files and then viewing this in a web browser.
	Script File Execution	This advanced command allows the 'calling' and execution of external scripting language files, for example, VBScript, JavaScript, etc.

Main Sequence

The Main Sequence command is used to indicate which items are installed on the machine. With these items selected you can begin to write and validate protocols based on the items installed. This way if you select an item in the step that is not compatible with a certain piece of labware, DARTs tip, etc., you will get a validation error to ensure your protocol is written correctly.

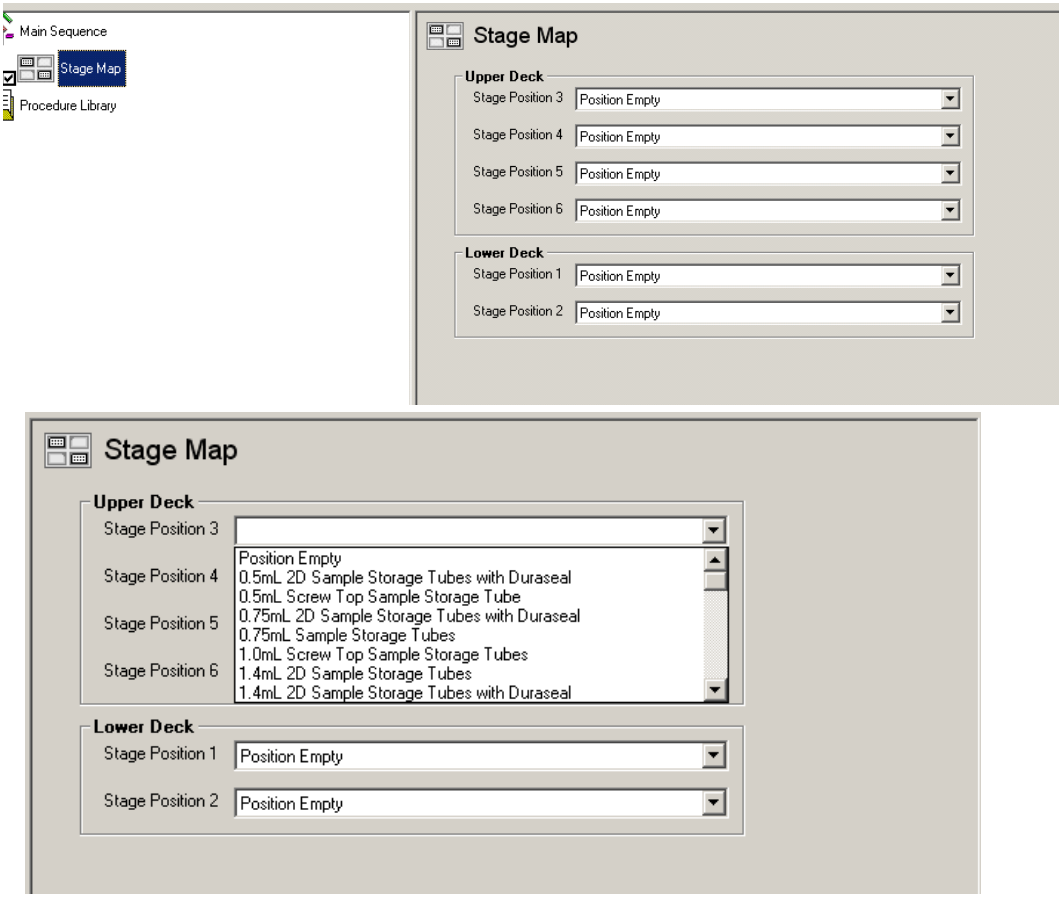


- Versette:
  Select the stage installed on the machine; default is the Versette 6 Position Stage “Versette 6 stage”
- Pipetting Module:
  Select the pipetting module installed on the machine; default is the “96/384 Pipetting Module”
- Pre-Installed Pipette Head:
  Select the check box if a pipetting head is currently installed
  - Head Type:
    Select which pipetting head is installed:
    - 384 channel 100µL
    - 96 channel 30µL
    - 96 channel 300µL
  - Reset to aspirate origin:
    Selecting this checkbox resets the pipetting head pistons to the zero position. This is to ensure that the pistons have the complete travel length in order to accurately aspirate and dispense sample. For example; if a sequence was run and interrupted or stopped, the pistons could be left in a state where they are not at the “home” position. The next time a sequence is run, they would start from the last position before the sequence was aborted, not giving a full piston stroke to adequately aspirate full volume of the pipetting head. In this case an error could occur.
    If this checkbox is not selected, and there is sample in the tips from a previous sequence, then the next sequence that is run will start without homing the syringe axis.

- Pre-Installed Pipette Tip:
  Select the check box if a tip magazine is currently installed
  - Tip Type:
    Select which tip magazine is installed. Only the corresponding tip combinations appear in the drop down menu to prevent the user from selecting a non-compatible tip magazine configuration with a specified head type.
    - 384x100uL
      - 16 x 30 uL D.A.R.T.s® (5316/5317/5318)
      - 16 x 30 uL Ext. Length D.A.R.T.s (5416/5417/5418)
      - 16 x 100 uL D.A.R.T.s (5326/5327/5328)
      - 24 x 30 uL D.A.R.T.s (5316/5317/5318)
      - 24 x 30 uL Ext. Length D.A.R.T.s (5416/5417/5418)
      - 24 x 100 uL D.A.R.T.s (5326/5327/5328)
      - 384 x 30 uL D.A.R.T.s (5316/5317/5318)
      - 384 x 30 uL Ext. Length D.A.R.T.s (5416/5417/5418)
      - 384 x 100 uL D.A.R.T.s (5326/5327/5328)
    - 96x30uL / 96x300uL
      - 8 x 30 uL D.A.R.T.s (5586/5587/5588)
      - 8 x 30 uL Ext. Length D.A.R.T.s (5506/5507/5508)
      - 8 x 300 uL D.A.R.T.s (5516/5517/5518)
      - 8 x 300 uL Ext. Length D.A.R.T.s (5536/5537/5538)
      - 8 x 300 uL Ext. Length Wide Bore D.A.R.T.s (5546/5547/5548)
      - 12 x 30 uL D.A.R.T.s (5586/5587/5588)
      - 12 x 30 uL Ext. Length D.A.R.T.s (5506/5507/5508)
      - 12 x 300 uL D.A.R.T.s (5516/5517/5518)
      - 12 x 300 uL Ext. Length D.A.R.T.s (5536/5537/5538)
      - 12 x 300 uL Ext. Length Wide Bore D.A.R.T.s (5546/5547/5548)
      - 96 x 30 uL D.A.R.T.s (5586/5587/5588)
      - 96 x 30 uL Ext. Length D.A.R.T.s (5506/5507/5508)
      - 96 x 300 uL D.A.R.T.s (5516/5517/5518)
      - 96 x 300 uL Ext. Length D.A.R.T.s (5536/5537/5538)
      - 96 x 300 uL Ext. Length Wide Bore D.A.R.T.s (5546/5547/5548)
      - MSIA 96 tips - type 1 (standard magazine)

- MSIA 8 tips - type 1 (standard magazine)
- MSIA 12 tips - type 1 (standard magazine)
- MSIA 96 tips - type 2 (custom magazine)
- MSIA 8 tips - type 2 (custom magazine)
- MSIA 12 tips - type 2 (custom magazine)

Stage Map



Stage Map: This command is used for serial dilution protocols. This is so the machine knows which type of labware is present on a specific stage position on the deck so the pipetting head won't crash into another stage position that might have a taller piece of labware present. The plate map is a tool so you can configure the set up of the instrument when you start a protocol. It will use your set up to determine a safe travel height and to check when doing incremental row or column movements that the adjacent plate(s) are not taller than the one used for the dilution (possible crash).

For example; if you start out with one labware type (384 square well flat) and then have a move command with something different (384 well deep) it will update the stage map for future moves.

Note! As of 6-21-12, Stage Positions in the protocols override the stage map. If a different plate is selected within the protocol, then the plate in the protocol step will override the Stage Map selections.▲

Use the drop down menu in the Stage Position field to select the corresponding labware for the protocol. You can either choose from a list of defaults or add your own and select from your custom labware as needed. (To add/delete/modify labware, refer to the section Edit Labware Library)

- Upper Deck this reflects the higher stage positions on the deck of the machine.
  - Stage Position 3 select the labware type for stage location 3 on the deck
  - Stage Position 4 select the labware type for stage location 4 on the deck
  - Stage Position 5 select the labware type for stage location 5 on the deck
  - Stage Position 6 select the labware type for stage location 6 on the deck
- Lower Deck this reflects the lower stage positions on the deck of the machine.
  - Stage Position 1 select the labware type for stage location 1 on the deck
  - Stage Position 2 select the labware type for stage location 2 on the deck

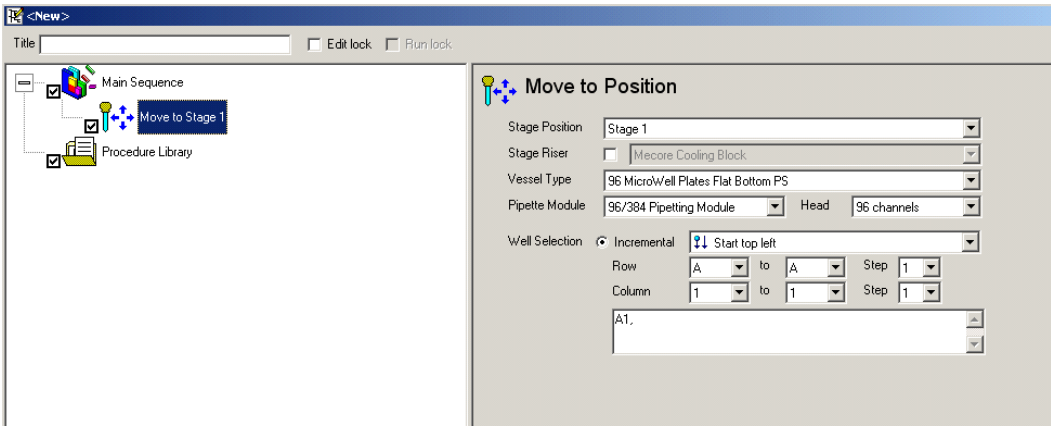
Home Axes

Home Axes: This command is used to reset or 'home' the stage to its default position as occasionally it may be necessary to reset an axis to its home position during file execution. It is possible to reset each individual axes or by selecting one option which resets all axes at once. You can select 'All' or uncheck the All check box to select one or more combinations of the X,Y,Z and Syringe Axis'.

Note! Resets all stage and head motors to their home positions. This is typically performed upon system startup or following the installation of a pipetting head. If desired, you can use this command to Home all axes to ensure all motions are highly accurate.▲

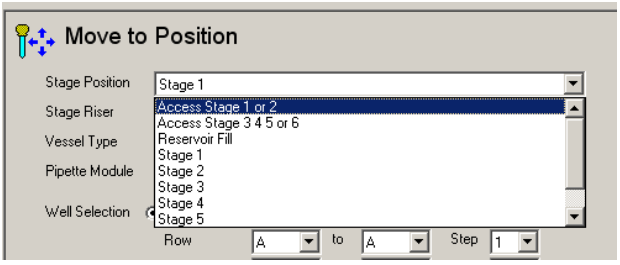
- All: this homes all the Axis' listed in this step selection to its default location: X, Y, Z, and Syringe.
- X Axis: this only homes the X Axis to its default location (to left)
- Y Axis: this only homes the Y Axis to its default location (to back)
- Z Axis: this only homes the Z Axis to its default location (up)
- Syringe: this only homes the Syringes to its default location (down)

Move to Position



Move: This command is used when you need to move the stage to a certain stage position on the machine. There are other fields that need to be selected to indicate what is on that particular stage position and which head is installed. The sequence of commands is always a 'move to' and then 'do something / perform an action'.

- Stage Position this reflects the position the machine will move to.

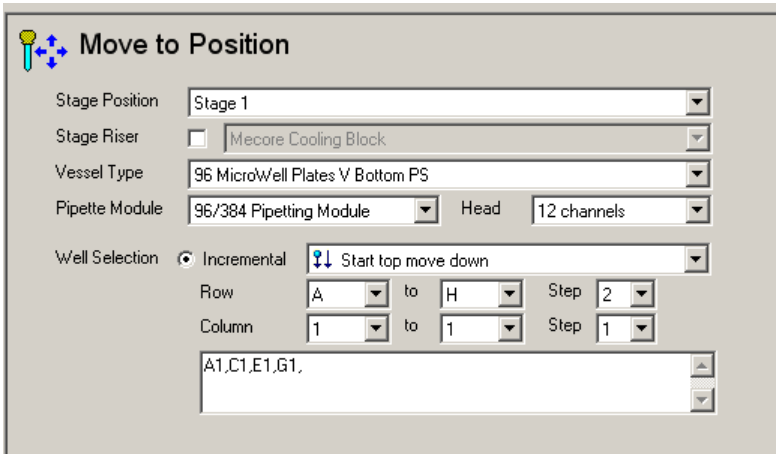


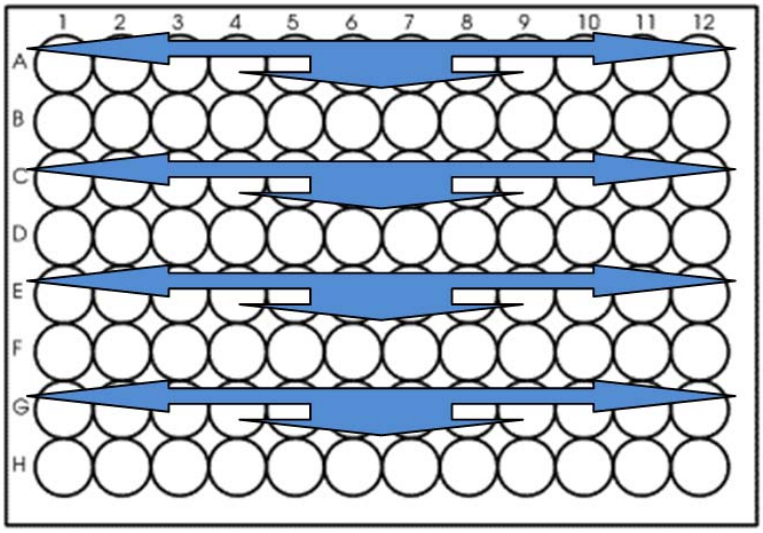
From the drop down menu select from the following choices:

- Access Stage 1 or 2: moves the stage to the default location in order to access stage 1 and 2 locations easily. The stage moves to the front center of the machine and the slider remains open. This capability is for removing / placing items on these two locations during a protocol.
- Access Stage 3 4 5 or 6: moves the stage to the default location in order to access stages 3,4,5 and 6 locations easily. The stage moves to the front center of the machine and the slider remains closed. This capability is for removing / placing items on these four locations during a protocol.
- Reservoir Fill: moves stage 1 to the to the reservoir fill location
- Stage 1: Stage 1 is positioned underneath the pipetting head
- Stage 2: Stage 2 is positioned underneath the pipetting head
- Stage 3: Stage 3 is positioned underneath the pipetting head

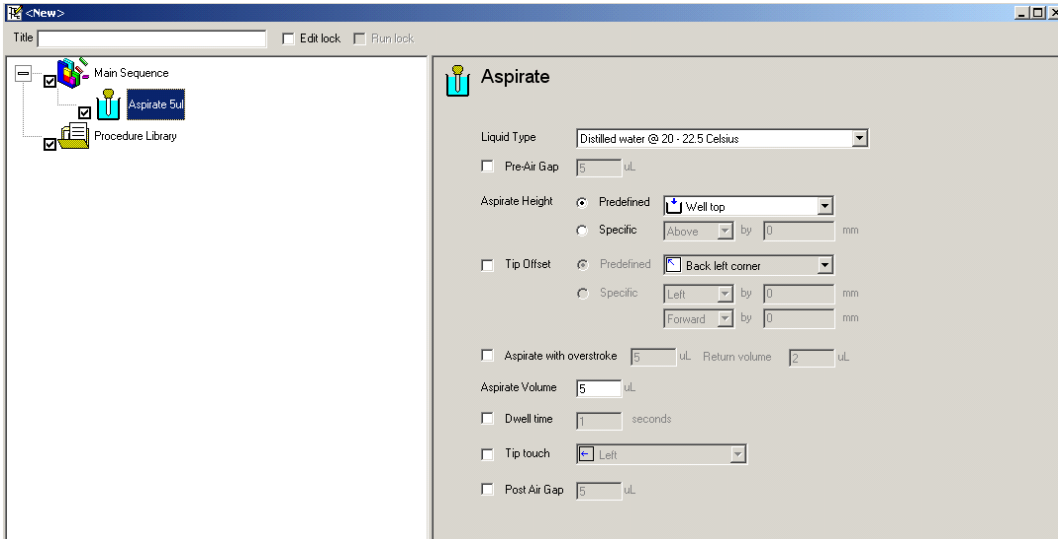
  - Stage 4: Stage 4 is positioned underneath the pipetting head
  - Stage 5: Stage 5 is positioned underneath the pipetting head
  - Stage 6: Stage 6 is positioned underneath the pipetting head
  - Wash: move to tip wash station location on stage 2
- Vessel Type: select labware items from a drop down list that references the Labware Library. Choices are 96 or 384 well plates and various tube/rack configurations. (To add/delete/modify labware, refer to the section Edit Labware Library)
- Pipette Module: defaults to the pipetting module installed on the unit
- Head: pipetting head/tip configuration installed on the unit. This can be changed depending if you need to use 8, 12 or 96 channels. If working with serial dilution magazines, this drop down would be changed according to the usage of columns (8) or rows (12) incrementing across a plate
- Well Selection: ability to select the wells that will be accessed in a sequence. Depending on the head that is selected, you can move certain directions to access the wells within a plate.
  - Incremental: select the direction to move within a plate. This feature is related to serial dilution and plate reformatting. This movement is based on the combination of the Vessel Type and Head selection above. For example, selecting a Vessel Type - 96 well plate and the Head type as:
    – 8 channels - Start left move right, Start right move left
    – 12 channels - Start top move down, Start bottom move up
    – 96 channels - Start top left

    Note! Selecting the 384 vessels and head type configurations will provide additional incremental movements across the plate. Refer to the drop down menu in this section for corresponding selections.▲
- Row: A - H (96 wells) / A - P (384 wells)
  - Step: number of wells moved per step across the plate. For example selecting "1" moves every row; selecting "2" moves every other row; selecting "3" moves every third row and so on.
- Column: 1 - 12 (96 wells) / 1 - 24 (384 wells)
  - Step number of wells moved per step across the plate. For example selecting "1" moves every column; selecting "2" moves every other column; selecting "3" moves every third column and so on.
- Empty Field represents the corresponding well locations the A1 tip will access selected within move command. The example below represents using 12 tips in a row loaded in a serial dilution magazine, moving from the top of the plate down to the bottom of the plate, placing the tips in every other row. These are the rows that will be affected by this sequence.


Move to Position
Stage Position
Stage 1
Stage Riser
Mecore Cooling Block
Vessel Type
96 MicroWell Plates V Bottom PS
Pipette Module
96/384 Pipetting Module
Head
12 channels
Well Selection
Incremental
Start top move down
Row
A
to
H
Step
2
Column
1
to
1
Step
1
A1,C1,E1,G1,


1 2 3 4 5 6 7 8 9 10 11 12
A
B
C
D
E
F
G
H

Aspirate



Aspirate: This command is used when you need to set the pick up or aspiration volume. Aspirates a measured volume with/without air gaps and/or overstroke in tips/syringes. There are other fields that need to be completed to indicate what features and parameters are needed to complete this step in the sequence.

- Liquid Type: The unit is factory calibrated with multiple fluid types, at specific temperatures and one volume point. This selection should reflect the liquid type that matches the sample volume being delivered. There are five presets to choose from that provides the closest match.
  - Distilled water @ 20 - 22.5 Celsius
  - 1% BSA @ 20 Celsius at 15 µL
  - 70% Ethanol @ 20 Celsius 150 µL
  - 30% Glycerol @ 20 Celsius at 30 µL
  - 90% DMSO @ 20 Celsius at 5 µL

You can also modify or add new calibration values to improve pipetting accuracy of liquids as it is possible to set a volumetric factor to use within the Aspirate and Dispense commands. The factor can be used to cause the piston motor to increase or decrease the number of steps required in order to achieve an accurate volume movement based on liquid sample type and also by environment operating temperature. This will assist in achieving very accurate volume dispensing. The factors are generated by using a standard volumetric correction factor for the specific liquid type at the temperature range required and to use this applied to the gravimetric measurement taken for the required volume. The net result will be the factor that will be used to correct the piston motor to achieve the required accuracy for the specific liquid/temperature range. (If you need to add a specific / custom liquid type, refer to the "Volumetric Calibration" section of this manual.)

- Pre-Air Gap: introduces an air gap at the top of the tip (before liquid is aspirated in the tip) to ensure that there is enough force to completely dispense all liquid from a tip during a dispense. This feature also aids in a more accurate dispense for single transfers of small volumes. During aspiration, you have the ability to aspirate more than one sample within a tip separated by air gaps.
- Aspirate Height: places the tip at a certain height within the well. This allows you to position the tip in a better position to provide a more precise aspiration within the well. For example, when aspirating sample from a well the tip may need to be better positioned lower in the well to ensure it doesn't introduce any air into the tip.

Note! These heights are predetermined based on the vessel types selected in the MOVE command and tips loaded in the machine.▲

  - Predefined: there are four preset heights to choose from:
    - Well top - at the top of the well
    - Well bottom - touching the bottom of the well
    - Aspirate - 2 mm above the well bottom (default)
    - Dispense - 2 mm below the well top (default)
    - These liquid handling depths can be modified by labware type as needed to optimize the tip heights within the well. Refer to the section Edit Labware Library.
  - Specific: select a custom height within the well
    - Above / below - position of tips above or below well top
    - By - the height in mm the tip is placed in the well

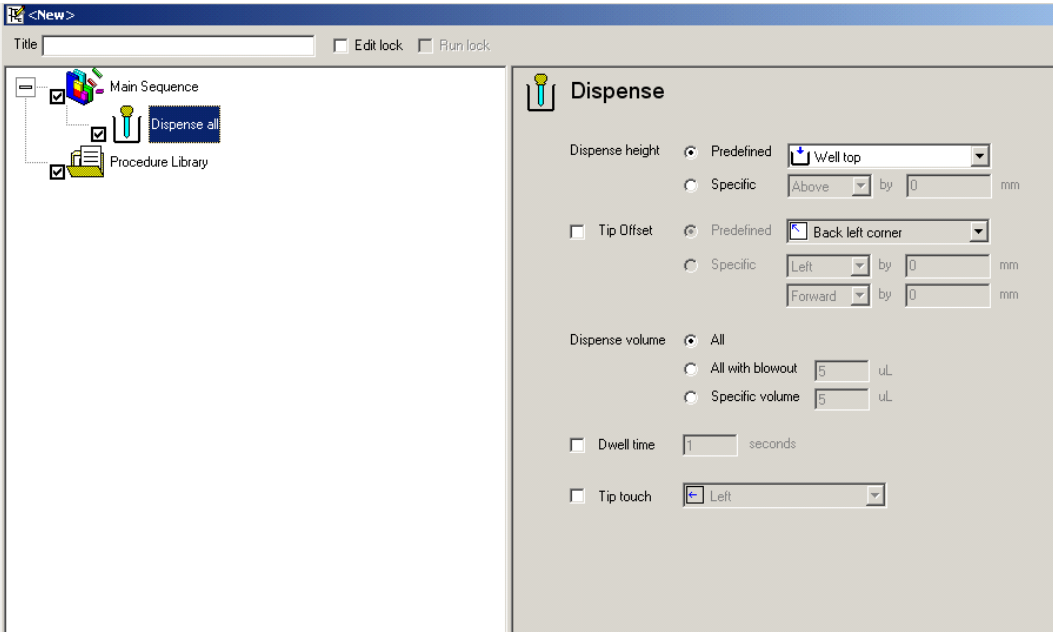
- Tip Offset: places the tip in a certain XY position within the well. This can be used if the tip needs to be in a better position to provide a more accurate aspiration within the well. Typical aspiration takes place at the center of a well. Selecting a tip/well offset sets the tip position either to a corner of the well, or to a specific X and Y axis offset value. For example, it may be necessary to position the tips away from the center of each well; when using 384-well plates with low volumes, the greatest accuracy might be provided by positioning the tips to touch off in one of the well corners. Checking this field will allow the setting of tip positioning either by choosing one of the pre-set positions or by entering specific X- and Y-axis offset values.
    - Predefined: there are eight preset tip offsets to choose from:
        - Back Left Corner
        - Back
        - Back Right Corner
        - Right Side
        - Front Right Corner
        - Front
        - Front Left Corner
        - Left Side
    - Specific: select a custom X and Y offset within the well:
        - Left / right - X axis within the well
        - Forward / backward - Y axis within the well
        - By - the distance in mm the tip is offset in the well
- Aspirate with overstroke: can be used if this is the first aspirate prior to multiple dispenses. The overstroke sequence aspirates an additional amount of sample, then returns a portion of this liquid to the source. This will ensure that the piston motor is primed and improves volumetric accuracy throughout all subsequent dispense aliquots.
    - µL: when the aspirate with overstroke box is checked, enter the volume in µL to be initially aspirated in the tip
    - Return volume: amount that is returned into the source vessel

    The remainder of sample in the tip is the "aspirate with overstroke volume in µL" minus the "return volume".

    For example; (overstroke volume of 5µL) - (return volume of 2µL) = 3µL sample in tip.
- Aspirate volume: amount of volume to be aspirated in µL
- Dwell time: adds a specific time to wait/pause following an aspiration to allow for the fluid pressure to equalize within the tip or wait/pause after aspirating to allow for a complete pick up of sample. This is an optimization feature that ensures an accurate aspiration. Dwell time is represented in seconds.

- Tip touch: set a specific positioning in the vessel for tips/syringes to touch off. This is the "touch off" on the side wall, corner or bottom of a vessel that removes droplets adhering to the side / bottom of the tips/syringes after an aspirate or dispense. This command allows droplets to remain in the well rather than be carried away with the tips/syringes.
  - Left
  - Right
  - Back
  - Front
  - Back Left Corner
  - Back Right Corner
  - Front Left Corner
  - Front Right Corner
  - Well Bottom (dry)
- Post-Air Gap: introduces an air gap at the bottom of the tip (after liquid is aspirated in the tip) to ensure that the sample does not leak during instrument movements / pauses. This would be used to optimize a sequence when using volatile samples that would build up vapor pressure within the tip.

Dispense



Dispense: This command is used when you need to set the dispense volume. Dispenses a measured volume or the entire sample from the tips/syringes. There are other fields that need to be completed to indicate what features and parameters are needed to complete this step in the sequence.

- Dispense Height: places the tip at a certain height within the well. This can be used if the tip needs to be in a better position to provide a more accurate dispense within the well. For example, when dispensing sample into a well the tip may need to be better positioned higher in the well to ensure it doesn't introduce any air bubbles into the sample.

  Note! These heights are predetermined based on the vessel types selected in the MOVE command and tips loaded in the machine.▲

  - Predefined: there are four preset heights to choose from:
    - Well top – at the top of the well
    - Well bottom – touching the bottom of the well
    - Aspirate – 2 mm above the well bottom (default)
    - Dispense – 2 mm below the well top (default)

    These liquid handling depths can be modified by labware type as needed to optimize the tip heights within the well. Refer to the section Edit Labware Library.

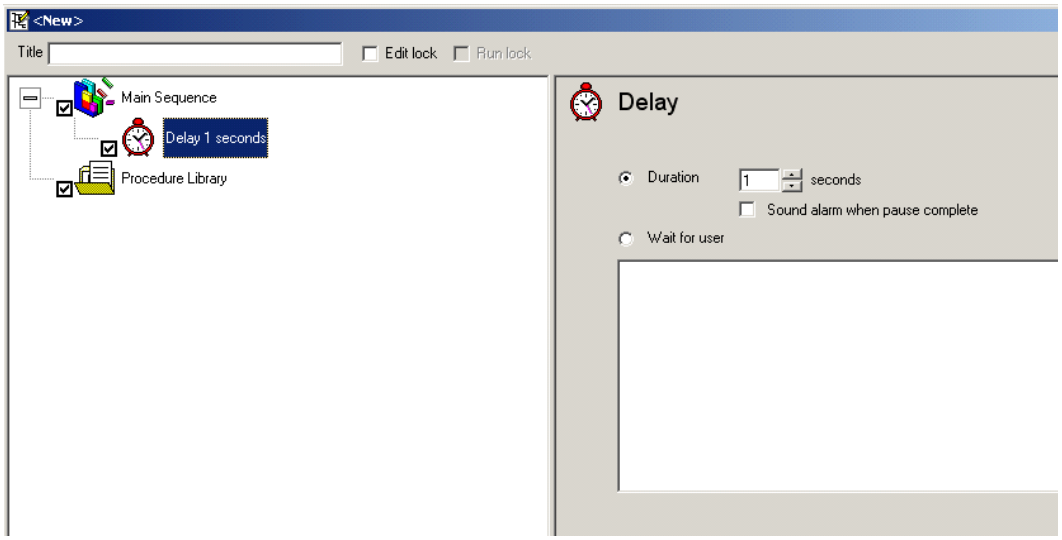
  - Specific: select a custom height within the well
    - Above / below – position of tips above or below well top
    - By – the height in mm the tip is placed in the well
- Tip Offset: places the tip in a certain position within the well. This can be used if the tip needs to be in a better position to provide a more accurate dispense within the well. Typical dispense takes place at the center of a well. Selecting a tip/well offset sets the tip position either to a corner of the well, or to a specific X and Y axis offset value. This is typically used with low volume dispenses; positioning the tips in the corner of a well provides additional surface area for the liquid to adhere. For example, it may be necessary to position the tips away from the center of each well; when using 384-well plates with low volumes, the greatest accuracy might be provided by positioning the tips to touch off in one of the well corners. Checking this field will allow the setting of tip positioning either by choosing one of the pre-set positions or by entering specific X- and Y-axis offset values.

  - Predefined: there are eight preset tip offsets to choose from:
    - Back Left Corner
    - Back
    - Back Right Corner
    - Right Side
    - Front Right Corner
    - Front

  - Front Left Corner
  - Left Side
- Specific select a custom X and Y offset within the well:
  - Left / right – X axis within the well
  - Forward / backward – Y axis within the well
  - By – the distance in mm the tip is offset in the well
- Dispense volume: amount of volume to be dispensed in µL
  - All: dispenses the entire volume of sample from the tip
  - All with blowout: dispenses the entire volume of sample from the tip plus a set volume of air to ensure all sample is removed from the tip
    - Enter blowout volume in µL
  - Specific: dispenses a specific volume of sample from the tip
    - Enter specific volume in µL

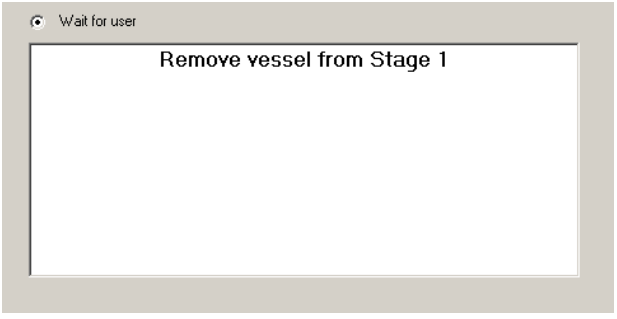
    This feature is used with performing a series of multidispenses to dispense a series of aliquots of sample
- Dwell time: adds a specific time to wait/pause during a dispense to allow for the fluid to be completely expelled from the tip or wait/pause after dispensing to allow for a full dispense. This is an optimization feature that ensures an accurate dispense represented in seconds.
- Tip touch: set a specific positioning in the vessel for tips/syringes to touch off. This is the "touch off" on the side wall, corner or bottom of a vessel that removes droplets adhering to the side / bottom of the tips/syringes after an aspirate or dispense. This command allows droplets to remain in the well rather than be carried away with the tips/syringes. Tip Touch is essential for extremely low volume dispenses where accuracy is essential.
  - Left
  - Right
  - Back
  - Front
  - Back Left Corner
  - Back Right Corner
  - Front Left Corner
  - Front Right Corner
  - Well Bottom (dry)

Delay



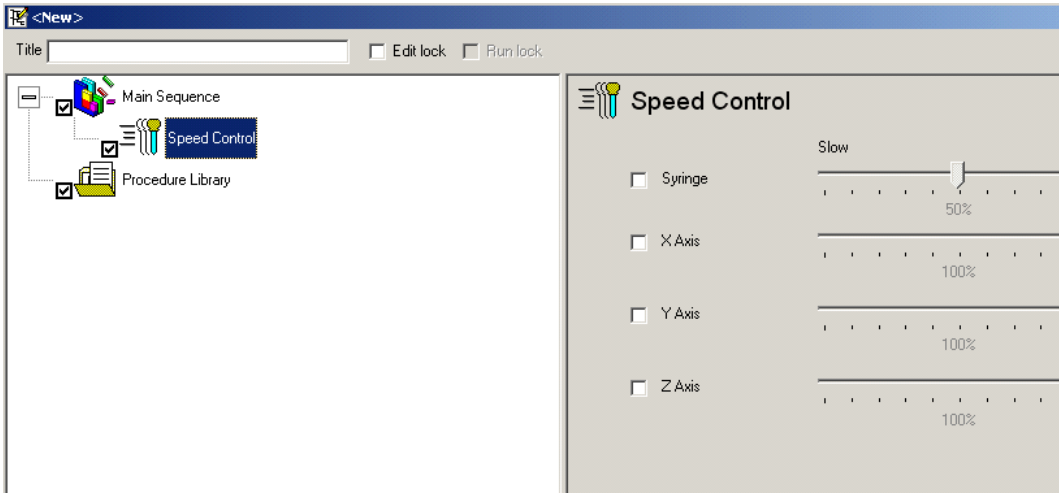
Delay: This command is used to enter a delay into a sequence. Delay sequence allows a programmed automatic timed delay, or prompts the operator to perform to take an action. Inserts a pause into a program to stop processing according to the pause parameters. Once the continue condition has been reached, the program continues to the next step within the sequence.

- Duration pauses/delays the sequence for a set number of seconds, the sequence continues after the delay parameter has been met
  - Seconds: enter the number of seconds to wait before proceeding to the next step in the sequence
  - Sound alarm when pause complete: with this selected the machine will pulse 5 consecutive sounds (windows default) before proceeding to the next step in the sequence. *Note: requires sound card installed.*
  - Wait for user select to delay until the user responds to a system prompt.



– Blank message field: enter a custom message to the user. This message will be displayed during the wait for user delay cycle.

Speed Control

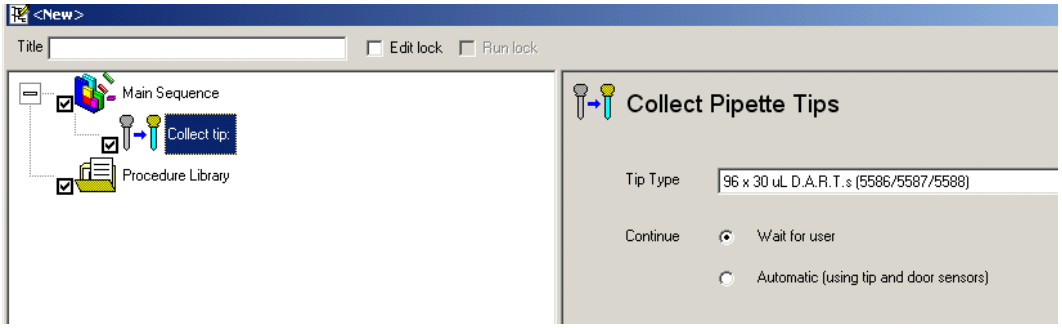


Speed Control: This command is used to control the speed of the pipetting head pistons (syringes), as well as other system motions that can be controlled to improve accuracy and precision for varying liquids; adjusts aspiration or dispensing speed, horizontal and vertical stage speeds, etc. Allows adjustment of piston (syringe-plunger) speeds for Aspirate, Dispense, Empty, and Wash operations.

Note! The speed can be used to optimize a sequence as the speed of aspiration and dispense will affect liquid handling results. In general, thick, viscous liquids require slower aspiration and dispense. The common occurrence of wicking (liquid adhering to the side of the tip or needle after dispense), hanging droplets (liquid not fully dispensing from the tip or needle), or full dispense of viscous liquids can be achieved by slowing the aspirate and/ or dispense speeds. Also, slow pipetting speeds are best for smaller volumes as they prevent droplets that form at the end of the tips from contacting the sides or top of the wells.▲

- Syringe: moves the syringes (pipetting head pistons) a specified speed (default 50%)
- X Axis: moves the stage in the X Axis (horizontally or left/right) a specified speed (default 100%)
- Y Axis: moves the stage in the Y Axis (vertically or forward/backward) a specified speed (default 100%)
- Z Axis: moves pipetting module which houses the pipetting head in the Z Axis (height or up/down) a specified speed (default 100%)

Collect pipette tips



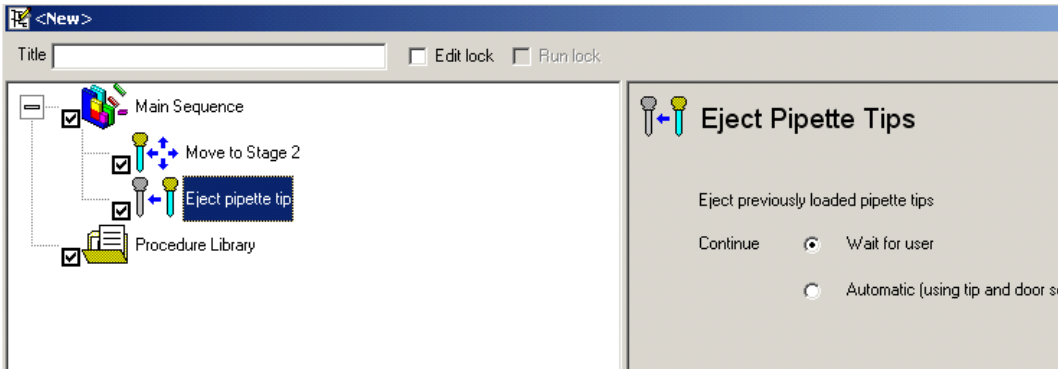
Collect pipette tips: This command pauses the system and wait for the user to load tips. (Refer to the Versette User Manual for instructions to load or unload pipette tips.)

- Tip type a predefined list of DARTs tips is loaded in the software. Choose the appropriate tip configuration from the drop down menu that corresponds with the head that is loaded in the machine. Choices consist of the following configurations:
  - Standard DARTs; non-sterile, sterile, sterile/filtered
  - Serial dilution magazines (pre-loaded with DARTs)
    - 8 column
    - 12 row
    - 16 column
    - 24 row
  - MSIA tips

- Continue: select how you want the tips to be loaded (see below)
  - Wait for user: system prompts the user through the steps to load a tip magazine into the mechanism
  - Automatic (using tip and door sensors): system relies on the sensor to detect when the user has installed a tip magazine. Automatically opens and closes the clamp based on the sensor being activated.

CAUTION If the user does not insert the tip magazine in a smooth and consistent fashion, the clamp could grab the tip magazine without it being fully installed properly in the mechanism.▲

Eject Pipette Tips



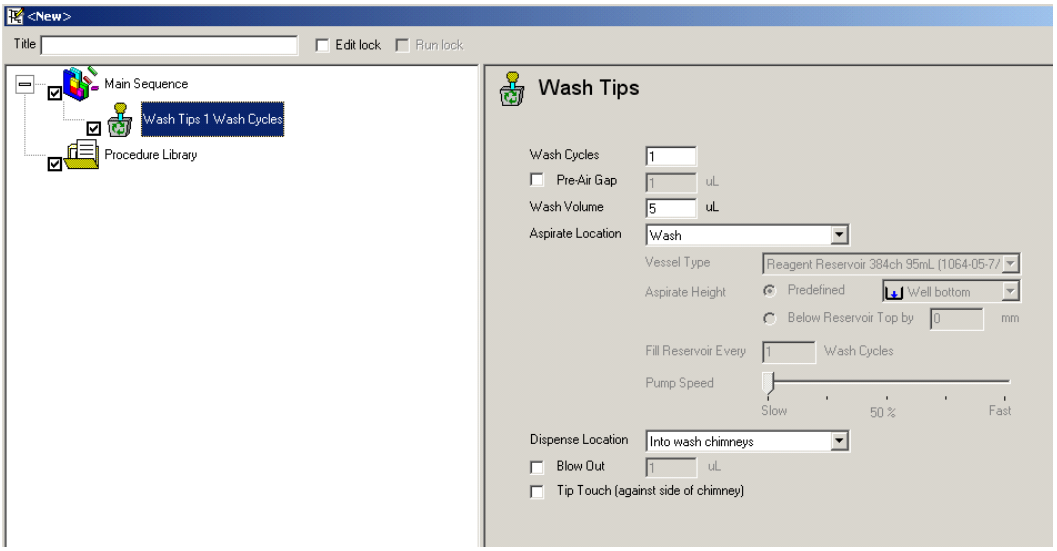
Eject Pipette Tips: this command pauses the system to prompt the user to remove the pipette tips, as may be required to change tips at the end of processing and wait for the user to unload tips.

This step requires that a move command be inserted before the installed pipette tips can be ejected from the mechanism. This ensures that the tips are positioned over an area so that if there is any liquid that remains on / in the tip it will not drip onto a vessel causing contamination of the sample. The tips should be moved to a stage position where no cross contamination can occur. For example a waste reservoir could be placed on Stage 2 so that the tips hover over this location when being removed from the system.

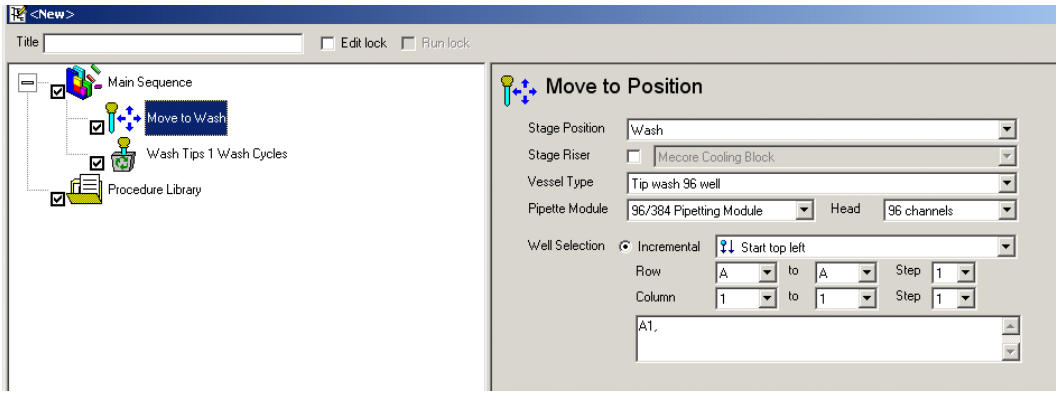
(Refer to the *Versette User Manual* for instructions to load or unload pipette tips.)

- Continue: select how you want the tips to be ejected (see below)
    - Wait for user: system prompts the user through the steps to unload a tip magazine from the mechanism
    - Automatic (using tip and door sensors): system relies on the sensor to detect when the user has removed a tip magazine. Automatically opens and closes the clamp based on the sensor being activated.

Wash Tips



Wash Tips: used for washing both the interior and exterior walls of disposable DARTs. The wash tips command facilitates the washing of both the inside and outside of each tip loaded in the tip magazine. The command uses the tip wash station which can be positioned at stage position 2. The command requires a preceding Move to position the wash station at the tips.



- Wash Cycles: defining the number of wash cycles required; one cycle is a complete aspiration and dispense
- Pre-Air Gap: introduces an air gap at the top of the tip (before liquid is aspirated in the tip) to ensure that there is enough force to completely dispense all liquid from a tip during a dispense.
- Wash Volume: amount of volume to be aspirated/dispensed within the tip in µL
- Aspirate Location: select which stage position to aspirate liquid from:
  - Wash: tip wash station positioned on stage location 2
  - Reservoir Fill: reagent reservoir positioned on stage location 1

- Vessel Type: only accessible when the aspirate location chosen from a reservoir fill (above)
  - Reagent Reservoir 384ch 95mL (1064-05-7/1064-15-7)
  - Reagent Reservoir 96ch 125mL (1064-05-8/1064-15-8)
  - Reagent Reservoir 96ch 220mL Deep Well (1064-05-6/1064-15-6)
- Aspirate Height: places the tip at a certain height within the chimney of the tip wash station. This can be used if the tip needs to be in a better position to thoroughly wash the interior / exterior walls of the DARTs.

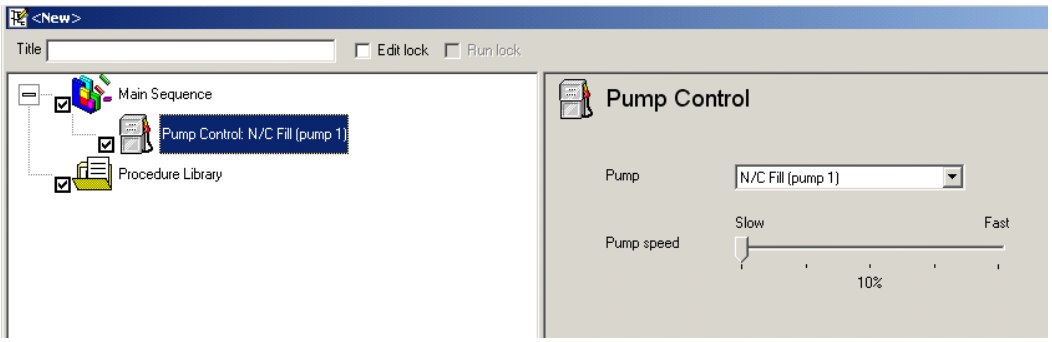
  Note! These heights are predetermined based on the vessel type selected in the MOVE command and tips loaded in the machine. These liquid handling depths can be modified by labware type as needed to optimize the tip heights within the chimneys. Refer to the section Edit Labware Library.▲

  - Predefined
    - Well bottom
    - Aspirate height
    - Dispense height
  - Below Reservoir Top by: the amount in mm to place the tip in the reservoir measuring from the top of the reservoir down into the chamber
- Fill Reservoir Every 'X' Wash Cycles: enter the amount of wash cycles to be completed before the reservoir fill is activated to refill the chamber
- Pump Speed: tip wash pump speed can be controlled by using this field. Slide the marker to indicate the speed desired:
  - Slow = 10%
  - 25%
  - 50%
  - 75%
  - Fast = 100%

- Dispense Location: select which area within the tip wash station to dispense the liquid into:
  - Into wash chimneys: tips move above the chimneys to dispense liquid at a predefined height. This choice is accessible only if you have the aspirate location as "wash".
  - Between wash chimneys: tips enter into the location between the chimneys to dispense liquid at a predefined height. Performing this step reduces the risk of contaminating the wash solution. *Note: if aspirating from a reagent reservoir, this is the only option available so there is no potential to contaminate your second wash solution.*

- Blow out: this command is used to move the pipetting head pistons past the "zero volume" dispense point, pushing a small amount of air after the liquid. This extra amount of air aides in ensuring all the liquid is expelled from the tips.
  - Volume: enter the amount of air to be dispensed from the tip in µL.
- Tip Touch (against side of chimney): tips "touch off" on the side wall of the chimneys in order to remove any droplets adhering to the side / bottom of the tips after an aspirate or dispense. This command allows droplets to be removed from the tip orifice rather than be carried away with the tips.

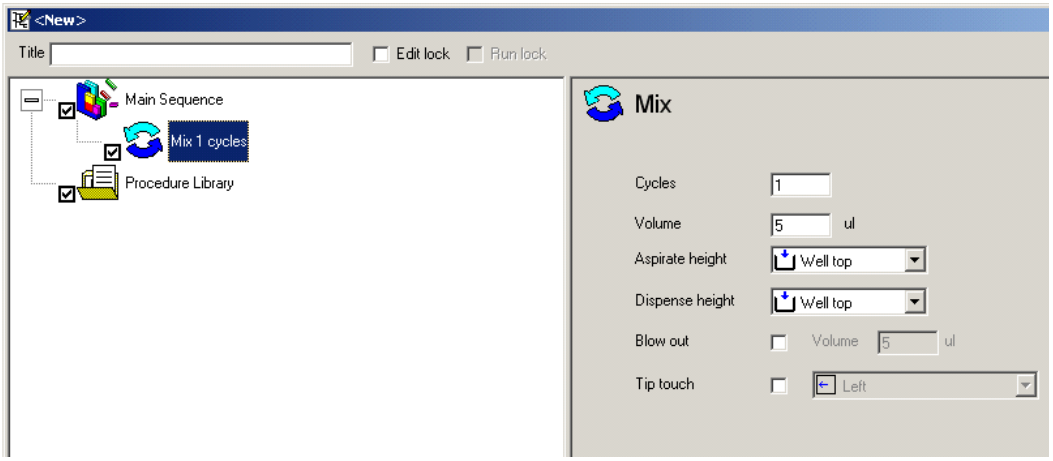
Pump Control



Pump Control: This command controls the N/C (non-contact) pump speed and settings

- Pump: select the pump that needs to be controlled; default is the N/C (non-contact) Fill for pump 1
- Pump Speed: tip wash pump speed can be controlled by using this field. Slide the marker to indicate the speed desired:
  - Slow = 10%
  - 25%
  - 50%
  - 75%
  - Fast = 100%

Mix



Mix**:** this command is a series of aspirate and dispense commands to mix a sample

- Cycles: amount of mix cycles to perform
- Volume: amount of sample to be mixed in uL
- Aspirate height: places the tip at a certain height within the well. (*Note: these heights are predetermined based on the vessel types selected in the MOVE command and tips loaded in the machine.*)
    - Well top - at the top of the well
    - Well bottom - touching the bottom of the well
    - Aspirate - 2 mm above the well bottom (default)
    - Dispense - 2 mm below the well top (default)
- Dispense height: places the tip at a certain height within the well. (*Note: These heights are predetermined based on the vessel types selected in the MOVE command and tips loaded in the machine.*)
    - Well top - at the top of the well
    - Well bottom - touching the bottom of the well
    - Aspirate - 2 mm above the well bottom (default)
    - Dispense - 2 mm below the well top (default)

Note! Choosing the proper aspirate and dispense heights within the tip allows you to get a more effective mix within the well, by creating a vortex within the tip to effectively combine the sample.▲

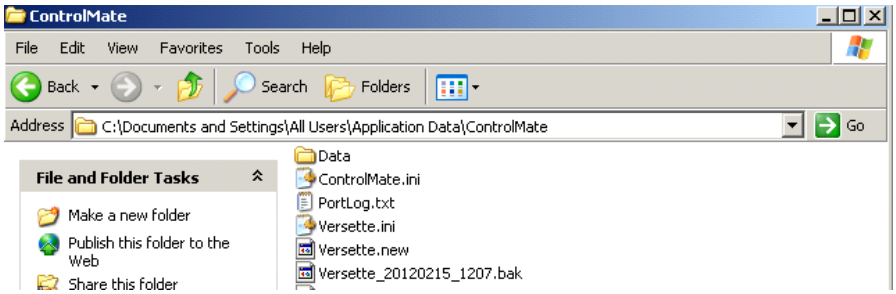
- Blowout: this command is used to move the pipetting head pistons past the "zero volume" dispense point, pushing a small amount of air after the liquid. This extra amount of air aides in ensuring all the liquid is expelled from the tips.
  - Volume: enter the amount of air to be dispensed from the tip in µL.
- Tip touch: set a specific positioning in the vessel for tips to touch off. This is the "touch off" on the side wall, corner or bottom of a vessel that removes droplets adhering to the side / bottom of the tips after an aspirate or dispense. This command allows droplets to remain in the well rather than be carried away with the tips. Tip Touch is essential for extremely low volume dispenses where accuracy is essential.
  - Left
  - Right
  - Back
  - Front
  - Back Left Corner
  - Back Right Corner
  - Front Left Corner
  - Front Right Corner

Advanced Protocol Creation Options, Commands, and Controls

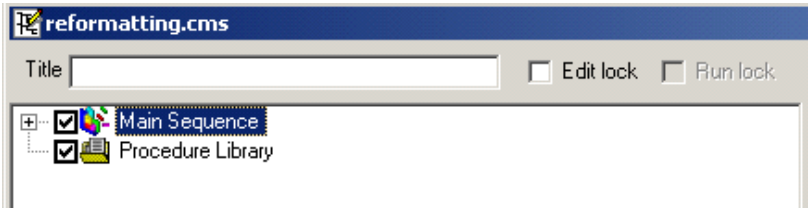
Saving Protocols / Sequences / Procedures

It is preferred that any sequences or procedure files be saved into the 'DATA' folder within the ControlMate folder. This way, users who share a computer within a lab can all access the same files from a central location. Also this folder can be backed up and all sequence files can be restored or added back into the Data folder as needed.

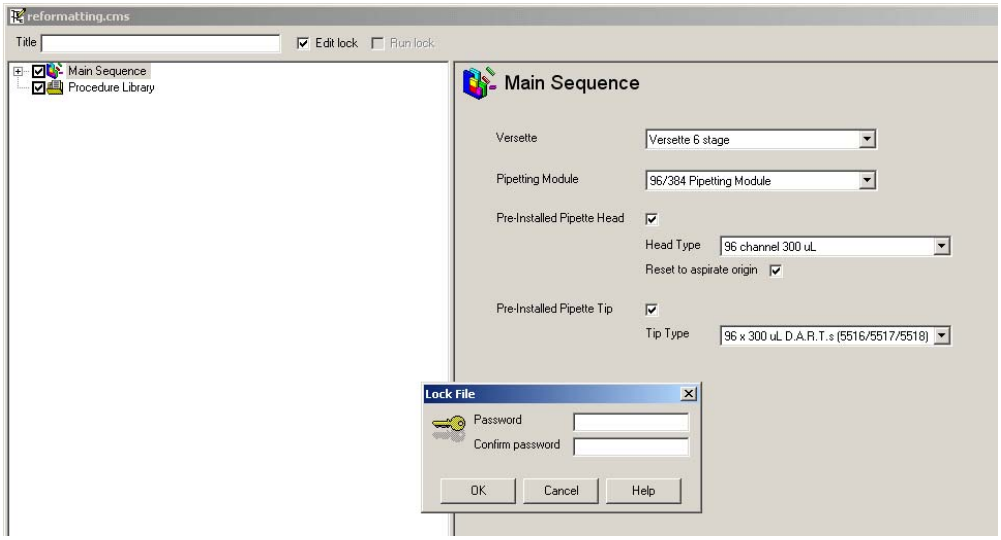
Example Windows XP Path to Data Folder:
C:\Documents and Settings\All Users\Application Data\ControlMate



Edit and Run Locks



The edit and run lock dialogues are used to control access to sequence file editing and execution on a file level basis. Once a lock has been set, the correct password is required to enable access to all file functions. This means that it is possible to create sequence files and then set an edit lock to prevent a file from being changed. This is useful for example, in creating file templates where the new files are created based on existing ones.

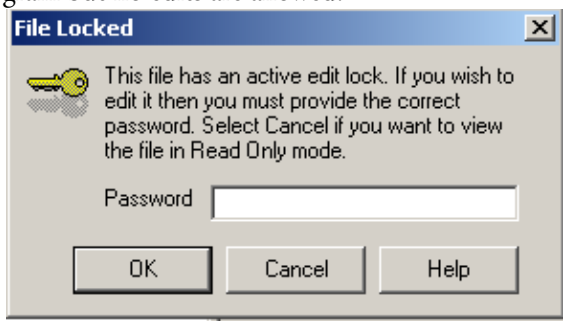


Edit Lock

This command is to set a password on the sequence file to control access for editing. Checking this box will display the Edit Lock dialogue window. You must enter in a password and then confirm the password by re-entering it again. If the two password entries do not match then the lock is not set.

Note! Passwords are case sensitive.▲

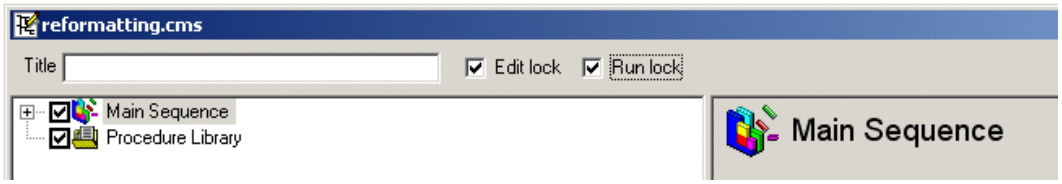
Without the proper password entry, the sequence file cannot be edited. Once you try to open an edit locked sequence file and you click the Cancel button, you can run the program but no edits are allowed.



User would click the cancel button to bypass the password entry to run the file sequence.

Note! Once the file is opened (by clicking on the cancel button) you can perform a "Save As", and rename the file. This way the file can be recreated from the original template and then the necessary changes can be made. Once re-saved, the edit lock will automatically uncheck and create a new template sequence based on the one that was locked. This newly saved sequence may be edited as necessary and then re-saved with or without an edit lock.▲

Run Lock

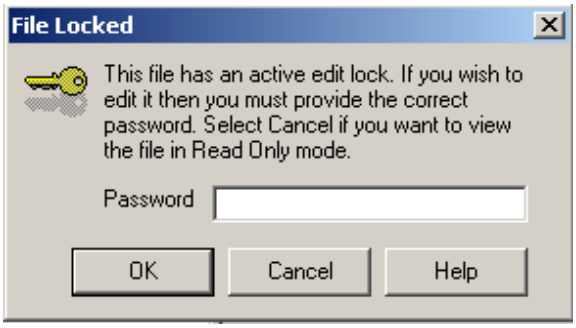


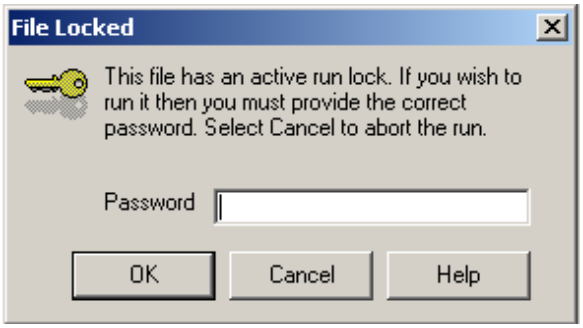
The Run Lock checkbox is used to set a password on the file to control access for execution. Checking this box displays the Run Lock dialogue window. Without the proper password entry, the sequence file cannot be executed on the device.

Note! Run lock can only be accessed if the edit lock has been activated.▲

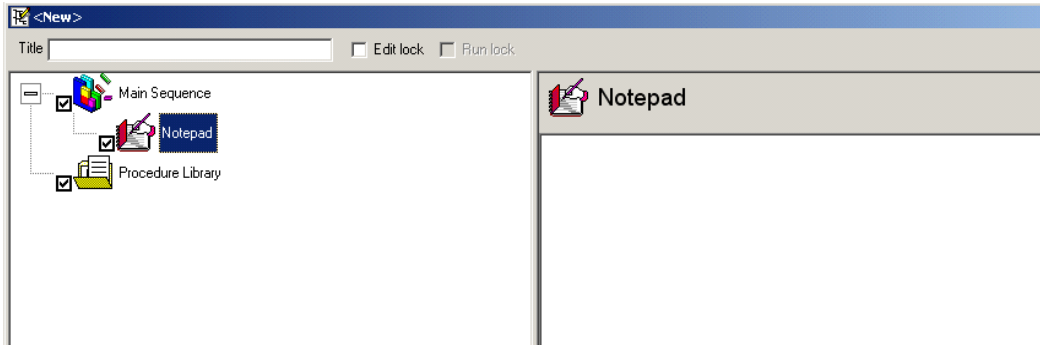
Once you open the sequence file and you enter the password to get into the edit lock portion, it will open the sequence to allow for editing or running. If you try to run the sequence and a run lock is also selected this is the same password as the edit lock.

- Password Validation:
  Sequence files that have an edit or run lock set will cause a dialogue box to be displayed whenever the file is opened within the sequence file editor (if edit lock set) or file execution (if run lock set). The dialogue will prompt for a password. If an incorrect password is entered, file access via the lock is not granted.





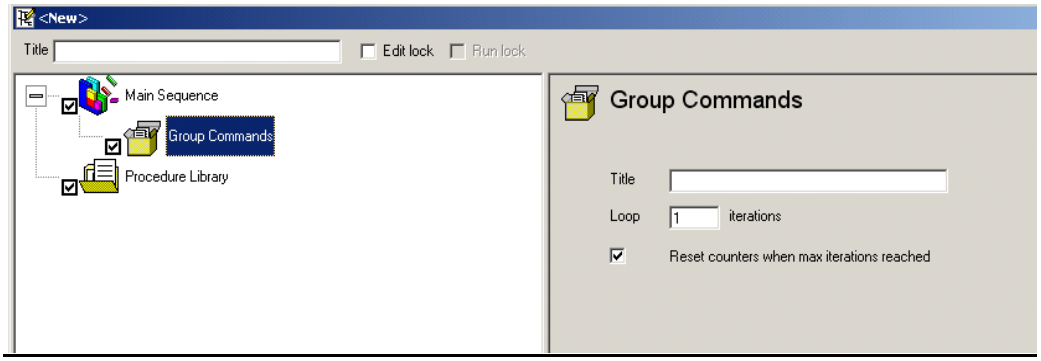
Notepad



The Notepad command allows you to enter notes about your protocol in the sequence file. Useful for documenting the steps in the sequence and for reminders during the pipetting procedure. Examples are, but not limited to the following: identify what is loaded on each stage location at the start of the run, who created the protocol and on what date, what edits have been made to the sequence, etc.

Note! The Notepad has nothing to do with running a sequence. It is used for notation purposes only.▲

Group Command

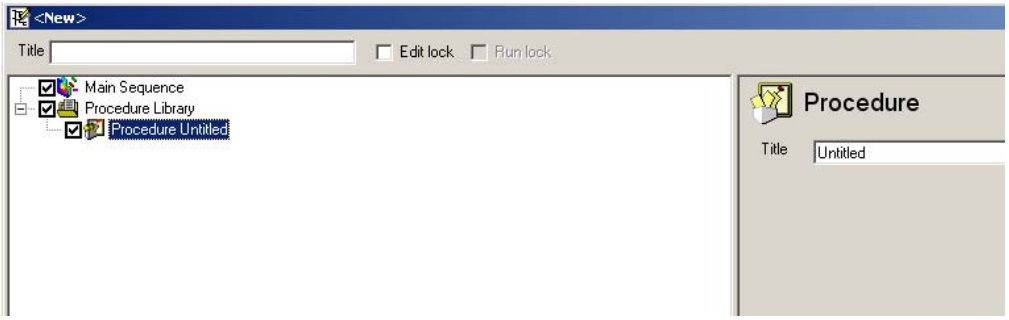


"Group Command" groups together commands for a common purpose. For example, the commands used to perform a common mix procedure, serial dilution or other steps within a sequence can be grouped together and labeled for individual steps to be performed in a protocol. Group commands can also exist within group commands, referred to as "nested groups".

Note! There is no limit on the amount of nesting groups. However, the longer the protocol and more groups inserted, validation of the protocol may take longer.▲

- Title:
  enter a label or title for the group for easy identification within a sequence
- Loop iterations:
  this is the number of times a specific set of steps will repeat the process contained within the group
- Reset counters:
  when max iterations reached when this checkbox is selected the counters reset to zero to start over from the starting position selected. If this box is NOT selected then the counters will continue within a protocol from where they left off. For example, if performing a serial dilution dispense across a plate and the last column dispensed into was 6, the next time the serial dilution continues it will start from the next column (7) and continue through the plate. This is helpful if you want to start or finish within a certain position within a plate or labware item, if the checkbox is left unchecked.

Procedure



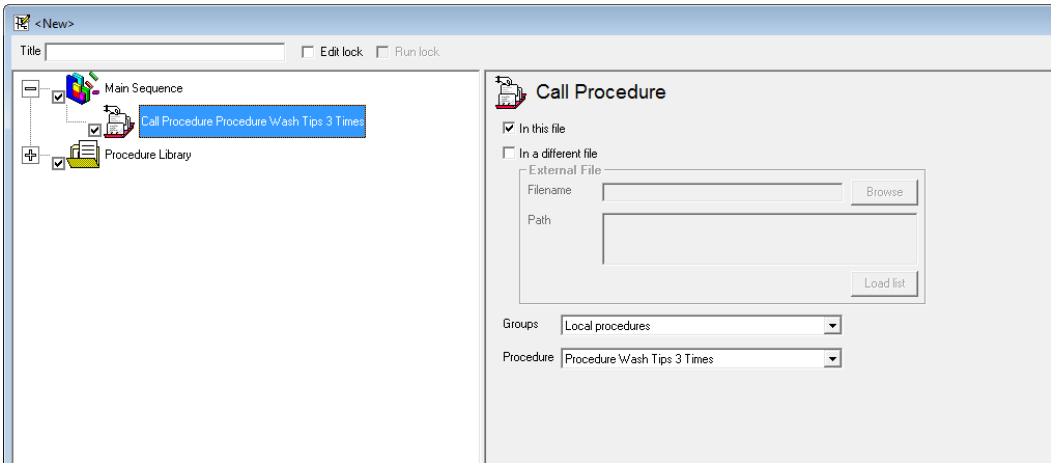
Procedures are a series of commands that are 'grouped' and included in a program listing. The main protocol / sequence can make a special call to a sub-procedure to execute the sub-procedure commands. The procedure could be a standard pipetting sequence that is routinely re-used in a program. Instead of copying and pasting multiple copies of the various steps, a call to run the 'procedure', can be done multiple times. For example, a main program might call a procedure that contains a move/aspirate/move/dispense step, multiple times throughout the program. Examples are provided later in this section of the manual.

Note! This step can only be used under the Procedure Library section within a sequence.▲

- Title:
  enter a label or title for the procedure for easy identification within a sequence

Note! You can write several procedures and store them within a protocol / sequence and call them as needed from this location. If you have a protocol / sequence folder saved on the desktop or other location, you can call a procedure from procedures stored in the folder as well.
In some instances all the procedures might be saved on a server so they are stored in a central location for users to access as needed.

Call Procedure



The “Call Procedure” command can be used to ‘call’ a previously defined procedure (refer to Procedure Library and Procedure commands) into a current pipetting sequence. For example, you might call a previously written “Wash Tips” procedure that moves to the wash station and performs various aspirations and dispenses with wash fluid.

A procedure can be called from within the current sequence file or from a previously defined procedure that is included within another saved sequence file from the computer. This “Call Procedure” command can save time and provide uniformity of operation by reusing existing procedures.

- In this file: allows you to call a procedure listed from the current sequence “Procedure Library”
- In a different file: allows you to call a procedure located from a different pipetting sequence. This is useful in a situation where a commonly used sequence is necessary or the same protocol is reused many times within a sequence. For example if a particular tip washing process is found to be effective you can call that one process into many different pipetting sequences where tip washing is required. Any changes made to the one sequence is applied to all sequences where it has been called.
  - External File: section to select filename and path of a procedure to be called
    - Filename: click the Browse button to navigate to the Control Mate Sequence (CMS) file where the target procedure is located.
    - Path: points to the folder location where the target procedure is located.
    - Load: list Loads the procedure loaded within the targeted External CMS file.

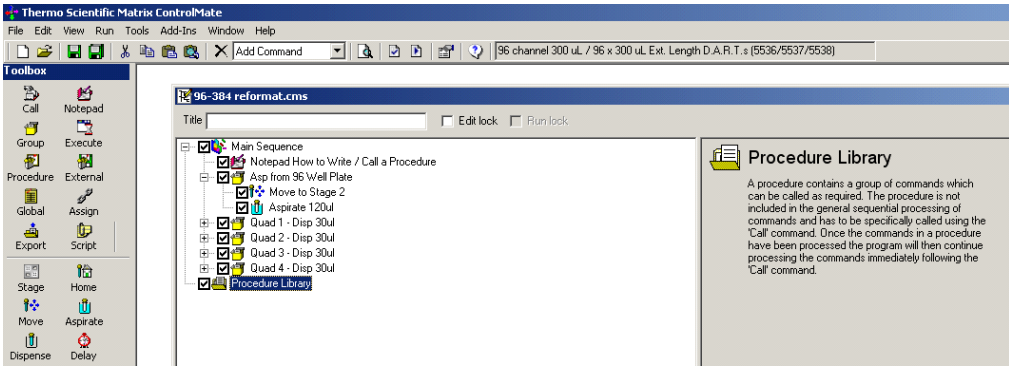
- Groups: Only accessible when ‘In This File’ is selected. Directs function to look in local groups.
  - Non Selected
  - Local Procedures
- Procedure: List of the saved procedures available in targeted external CMS file.

How to Write / Call a Procedure in a Protocol / Sequence

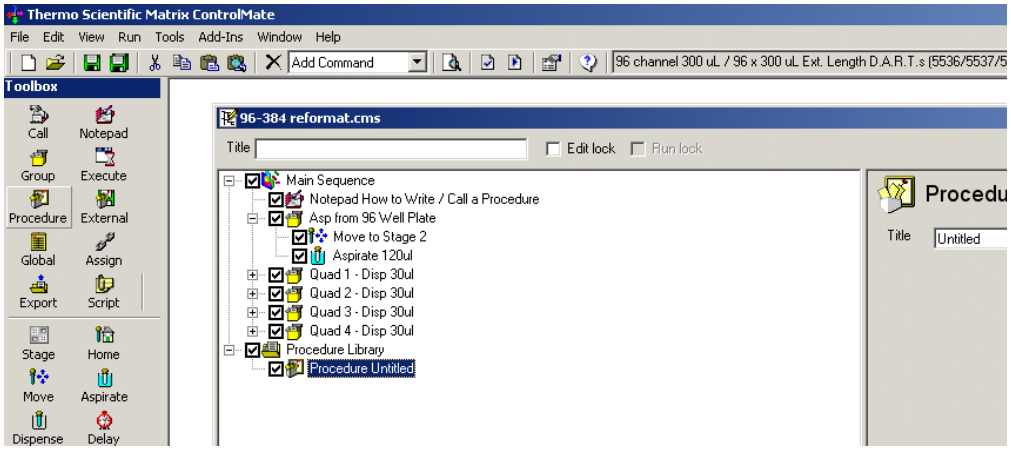
A procedure is used when you don't want any changes made to a specific protocol; call the same procedure multiple times within the same protocol, or in different protocols, or instead of having to edit all the sequence / protocols with a specific set of steps, you only have to make changes to one procedure which will change it within all sequences / protocols that it is referenced in at once.

To write a procedure:

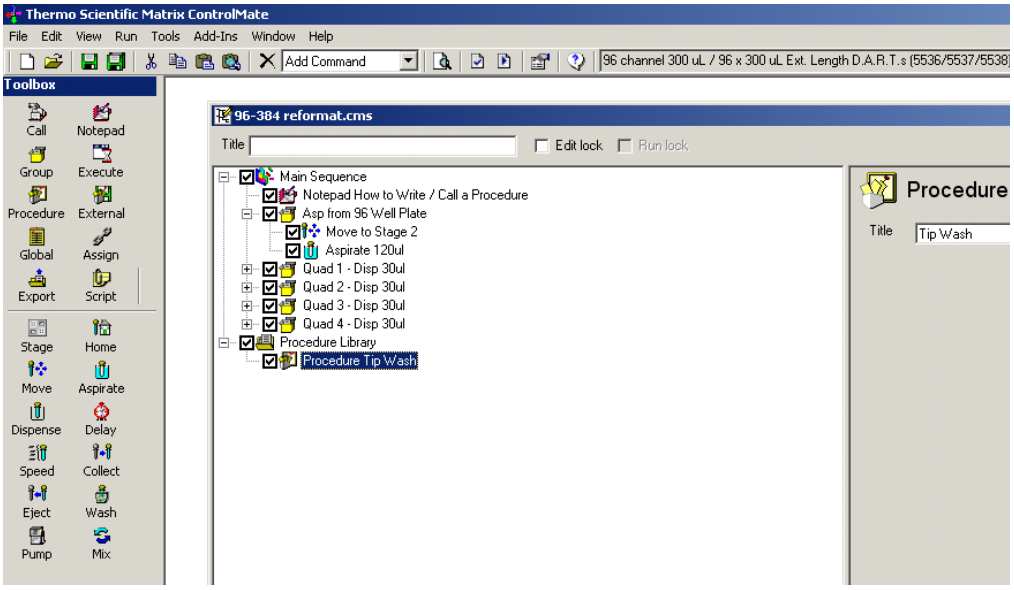
1. Click onto the Procedure Library Tab under the Main Sequence Tab



2. Click the Procedure Icon to insert it underneath the Procedure Library header.

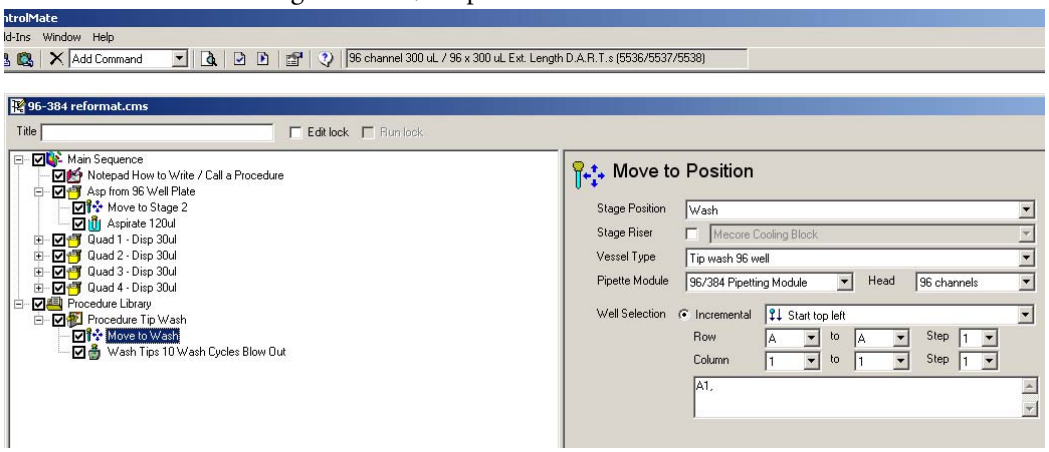


3. Click in the Title field and name the procedure “Tip Wash”

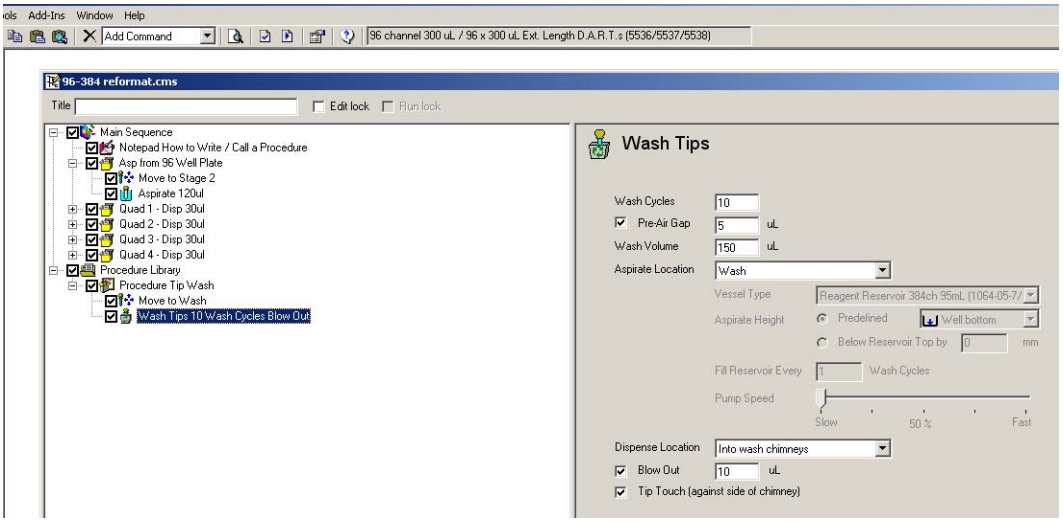


4. Write the protocol under the procedure as follows:

   a. Move to Wash Stage Position, set parameters



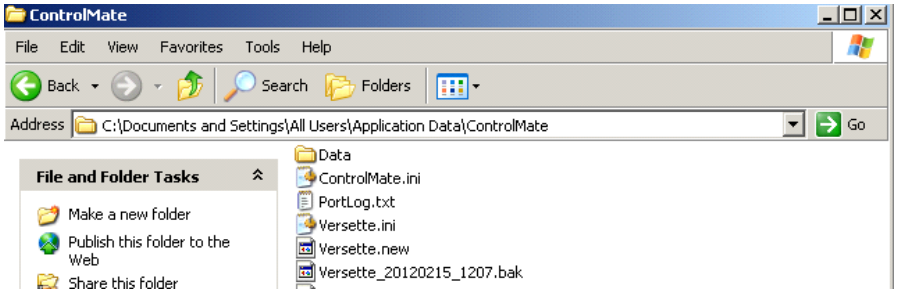
b. Wash Tips, set parameters



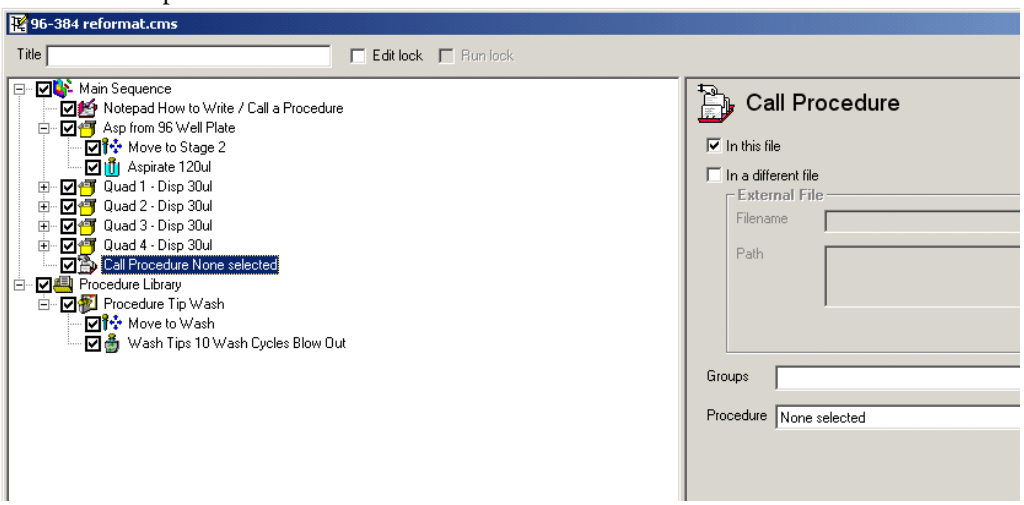
Note! You can write several procedures and store them within the current protocol and call them from the Procedure Library; or browse from another protocol, or if you have a specific procedure folder saved on the desktop or other location on the workstation, you can call a procedure from that location.▲

It is preferred that any sequences or procedure files be saved into the 'DATA' folder within the ControlMate folder. This way, users who share a computer within a lab can all access the same files from a central location. Also this folder can be backed up and all sequence files can be restored or added back into the Data folder as needed.

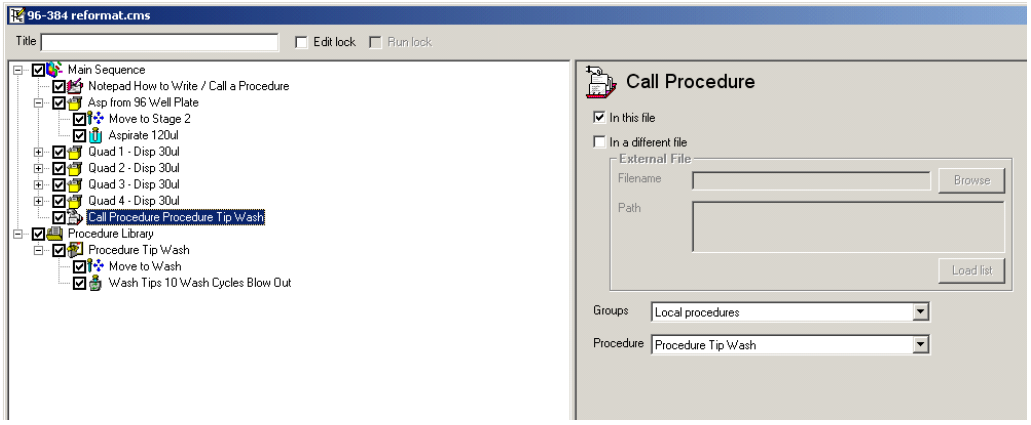
e.g. Windows XP Path to Data Folder *C:\Documents and Settings\All Users\Application Data\ControlMate*



5. Determine where in the sequence you want to add the procedure. Under the Main Sequence within your steps, click on / highlight the last step before the position you want to insert a call procedure step. Click on the Call icon in the toolbox to insert the Call Procedure step.

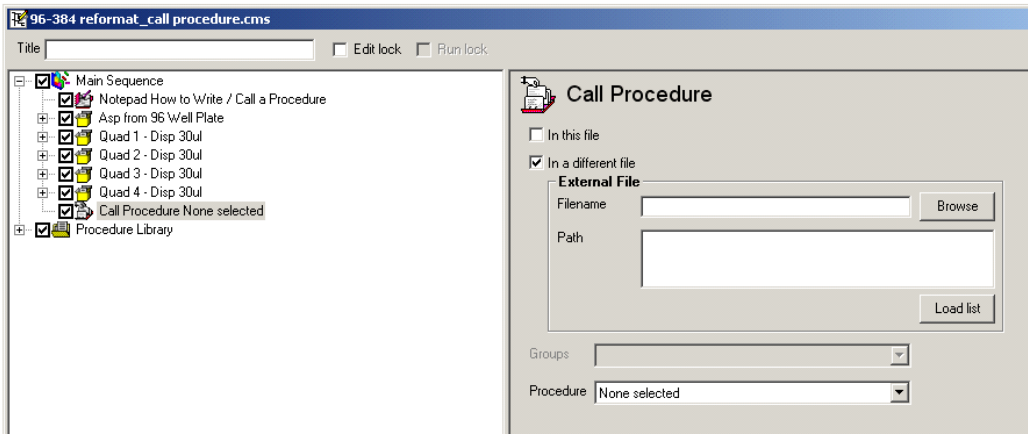


6. You have two choices to call a procedure.
   a. Call a procedure from within the same protocol / sequence:
      - Select the “In this file” checkbox
      - In the Groups field use the drop down menu and select Local Procedures
      - In the Procedure field select “Procedure Tip Wash”

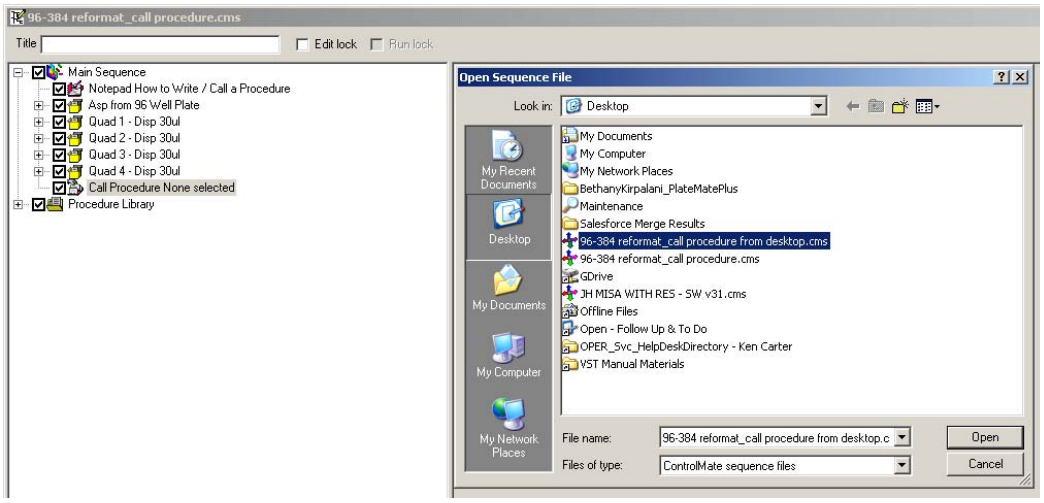


b. Call a procedure from another location (server, desktop, folder in C:Drive, etc.)

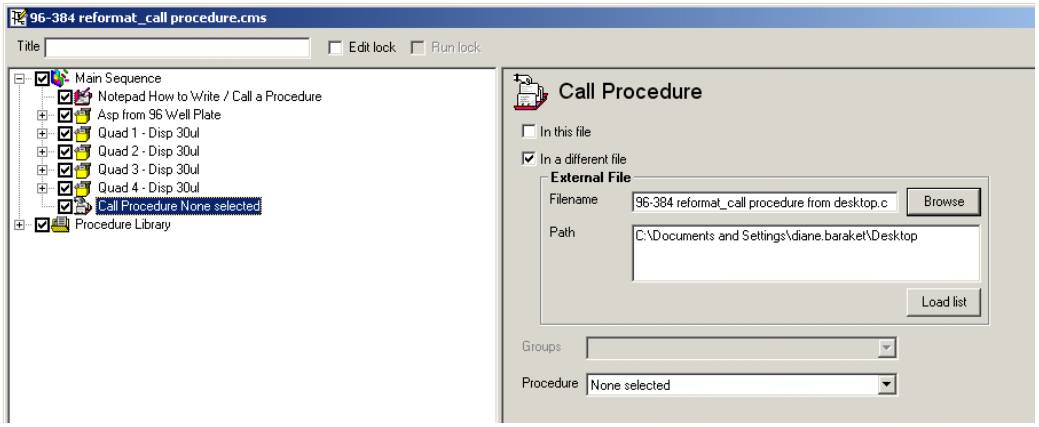
- Select the “In a different file” checkbox



- Under External File, Browse for the sequence filename from the desktop
  - Example: 96-384 reformat_call procedure.cms from desktop.

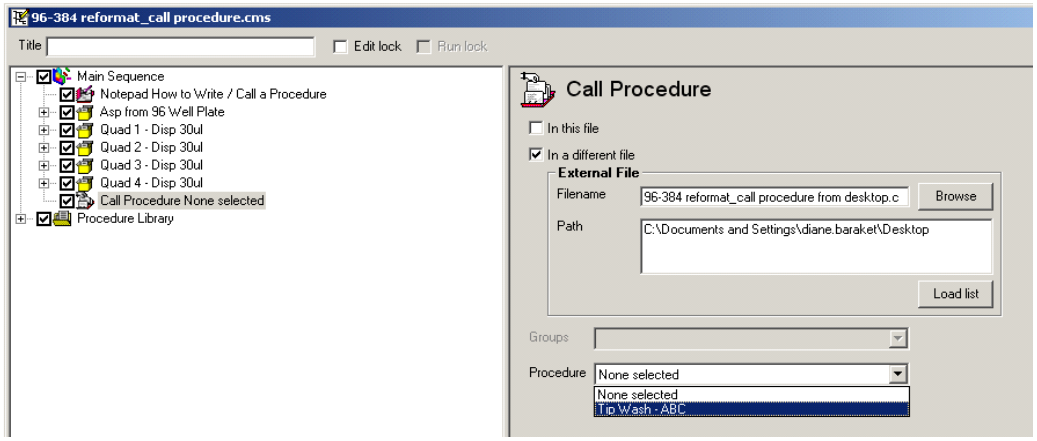


- Click Open, Filename and Path fields; prefill with name and location of the file chosen
- Click Load List button; this loads the file into the Procedure field to select
  - If you do not click on Load list button, no procedure downloads to drop down menu for selection in the Procedure field

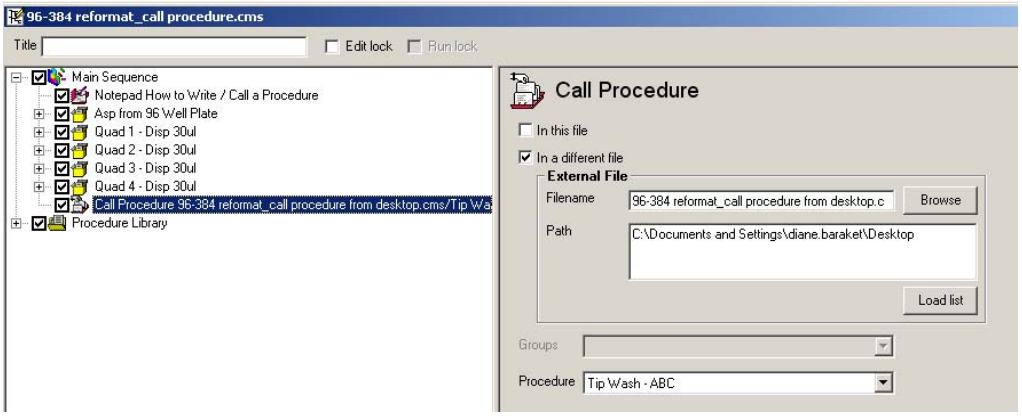


– Groups field is grayed out (not used here)

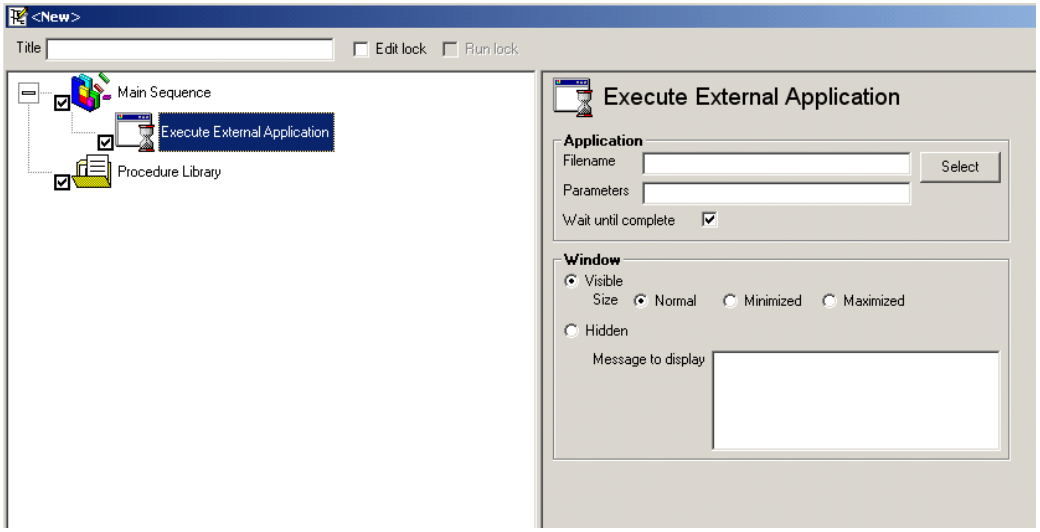
– In the Procedure field, use drop down to select the appropriate procedure from the sequence you just loaded



– Click Set button; Call Procedure in sequence name changes to file loaded



Execute External Application



This command launches an external application. For example, launch the Windows Paint program to display a graphic on the screen to alert the user when a step is completed, or prompt the user to take an action. You could also launch a sound file within a protocol or even send an email (via your email application, e.g. Outlook) within a protocol using this feature. This is useful for long sequences to notify the technician that a certain step has been reached or a protocol has been finished.

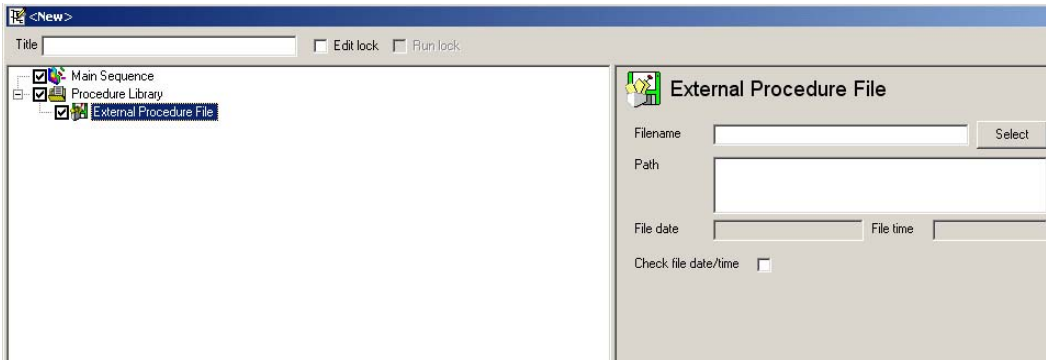
Note! The applications and files used in this feature are created from a specific path to be run and accessed. If this path changes, then they have to be redirected in order to access them again within a sequence. For example, if the files are in a specific folder on the desk top and that folder is moved, then the path cannot be found and needs to be redirected from the new location.▲

Application: includes fields for application to be used and name of the file to be used

- Filename: enter the application file name in this field; you can browse for the program by clicking on the Select button
- Parameters: are the command line parameters that are sent to the external application when it is launched; for example: if the external application selected is Windows Notepad, then the parameters would be the file address or actual file that will be accessed; this has to be typed EXACTLY as it is named for the file to work. Enclose the entire field in double quotes (“ ”); this is to ensure the file will work properly in case there are spaces or symbols within the filename or the file path. For example, “C:\notes\display_my_file_notes_1.txt”
- Wait Until Complete: checking this box pauses the protocol until the application is closed

- Window: how the internal application is to be displayed
  - Visible: controls whether or not to display the application. If you call an email application you wouldn't display it, however if it was notepad you would display it. Select this radio button if you want the file or item that is opened to display on the screen
  - Size: dimension of the window that is displayed on the screen
    Normal – default window size displays file on screen
    Minimized – window is in the 'minimized' state on the screen
    Maximized – window is in the 'maximized' state on the screen
  - Hidden: hides the application from display
  - Message to display: an additional text 'pop up' message is displayed if the user elects to hide the launch application; e.g. – "Sending Email"

External Procedure File

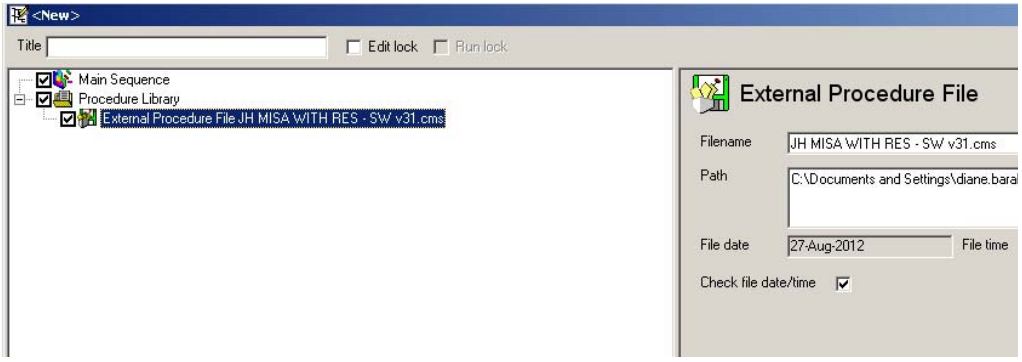


This command executes a sequence that has been stored; disk, folder, desktop, etc. A sequence could be a complete serial dilute program, for example, or a wash sequence, or any sequence of commands that can be re-used and called by another program.
To save time, you could consider creating a batch of procedure files for templates to have readily available as needed when creating protocols.

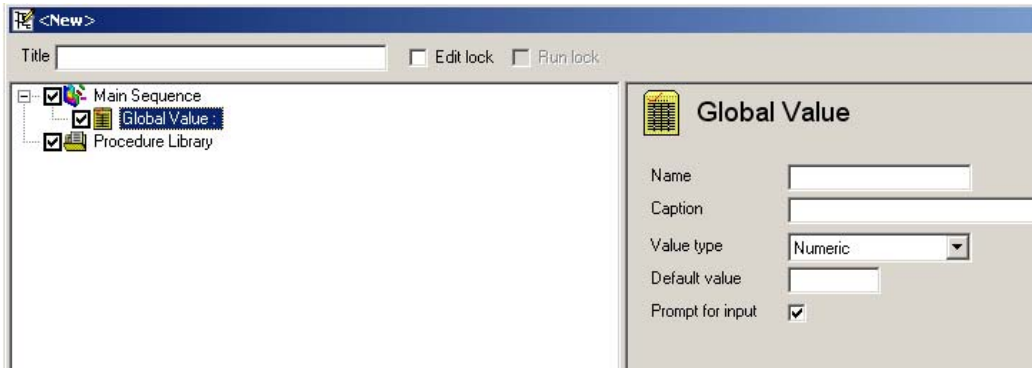
Note! This step can only be used under the Procedure Library section within a sequence.▲

- Filename: enter the file name that is to be called in this field. You can also browse for the program by clicking on the Select button.
- Path: once the file name has been selected this field will prefill with the path where the file was stored
- File Date: shows the date the file was last modified; i.e.,13-Jun-2012; you will get a validation error if the file is changed

- File Time: shows the time the file was last modified; i.e.,09:27 (9:27AM), 15:30 (3:30PM), etc. (24 hour template)
- Check file date/time: checks the file to ensure this date/time matches the file that was selected to run only this version. If the file has been changed, the file should be reselected in the path with the newly modified version. This would be so that the wrong file is not accidentally executed in a external procedure file.



Global Value



Global Value commands can be added anywhere to the sequence file tree structure. Global Values is a component of the ControlMate software that allows the end user to be asked a series of questions that changes variable parameters throughout a sequence of protocol steps. The “Global” command in conjunction with the “Assign” command (refer to the Assign section for more information) facilitates an input of values that can be changed at various stages of the program without manual interface. The concept of Global Values is if a user has certain protocols that they run every day, but would need to alter or adjust variables they can assign Global Values to have the software change all the assigned variables for them. In cases where the administrator chooses to edit lock a sequence / protocol, incorporating Global Values also allows new users with limited ControlMate programming knowledge to operate

the instrument with specific parameters necessary for their application(s) without changing the main parameters of the sequence. Using Global Values reduces the possibility of human error caused by either missing or forgetting to change those variables (such as alternating aspirate volume, dispense volume, or the number of plates to run to be run).

- Name: A unique identifier by which the command can be referenced; label or name of the global command is defaulted in CAPS and if a space is used, prefills an underscore (_)
- Caption: prompt that is displayed to the user; for example “What is the aspiration volume?”
- Value Type: used for field entry validation, select the style of the value below

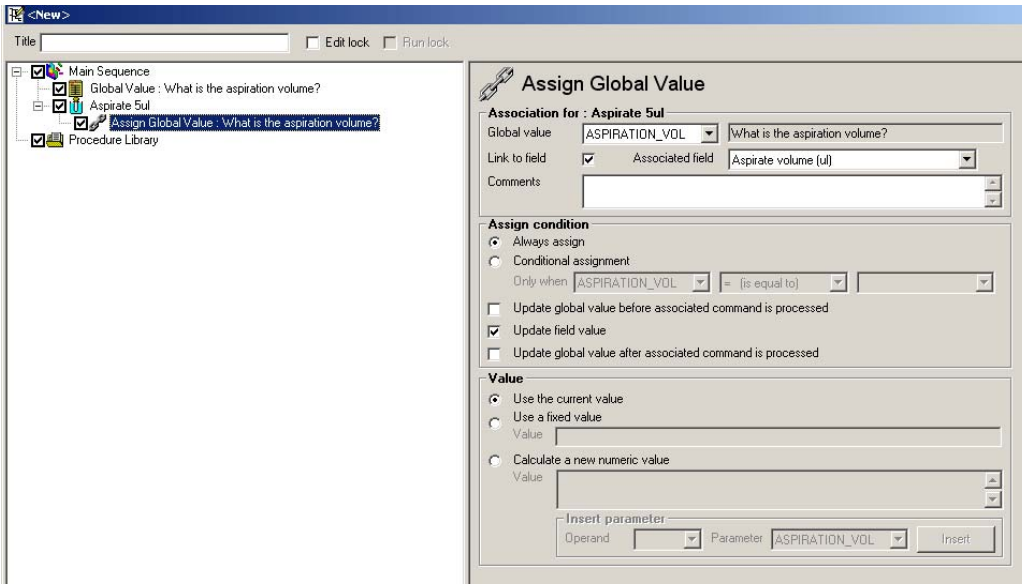
  Numeric: whole numbers, decimals, integers (5 or 5.5)

  Text: wording or text value; used for bar code / plate type or labware caption

  Boolean: represents a true / false statement
- Default value: this is the default value for the global command, if it is not changed, this is the amount of time something occurs; enter in the lowest number for iterations, volume, plate count etc. as default values appear when running the protocol /sequence. The user can override these values when prompted before executing any sequence file.
- Prompt for input: If this checkbox is selected, the text entered into the caption field is displayed to the user for input prior to running the sequence file. Once the user is prompted for input, and the “default value” can be adjusted for specified modifications the end user will have to click “OK” and the application begins. If this check box is not selected, the info updates automatically without prompting the user for input.

Once the sequence is run, the dialogue will show the relevant global value entries that have the *Prompt for input* checkbox checked and will display the default values that were entered (if any). The user will then be able to edit these values before pressing the *Start* button to commence file execution. This dialogue will also be displayed prior to any file validation sequence.

Assign Global Value



Assign Global Value: this command looks like a 3-link chain and needs to precede the command it will effect or be "linked" to. This step can only be used if a Global Value has been defined and in conjunction with the following standard commands: Stage, Home, Move, Aspirate, Dispense, Delay, Speed, Collect, Eject, Wash, Pump, and Mix.

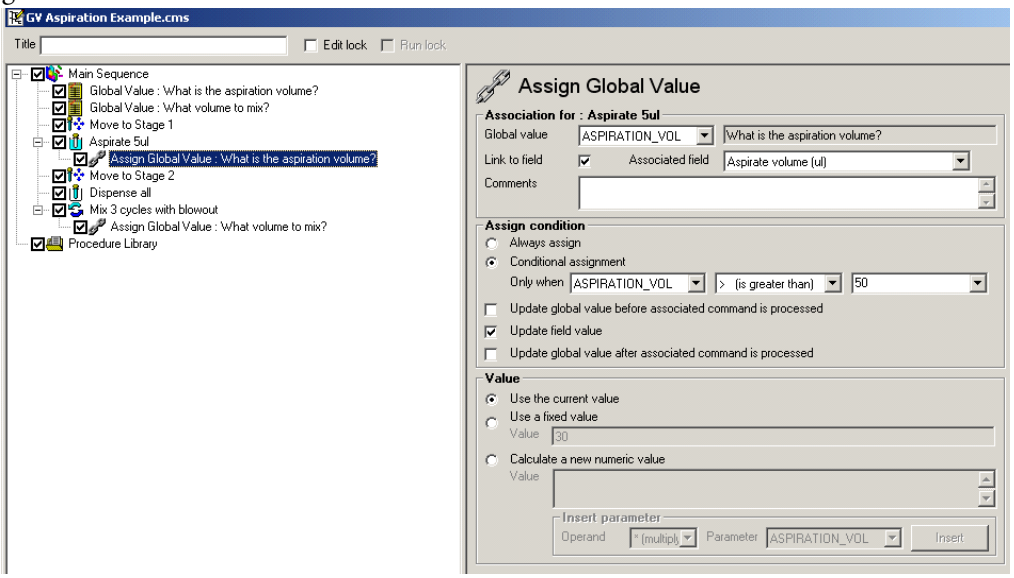
- Association for: step that assigned global value is linked to is listed in the title for this section
  - Global Value: presents, via a drop down box, the global value names that have been defined. The caption, i.e. the 'human readable' text entered when the Global Value was declared, associated with the global value will be displayed to the right of the selected field value.
  - Link to field: selecting this check box indicates that the current value of the Global Value will change and/or be changed by the current value of the associated command field.
  - Associated field: you can choose the field associated within the linked command to assign the global value to; e.g. applied global value to change the aspirate volume, aspirate volume would be chosen as the associated field. This drop down box contains all of the fields available within the currently selected command (e.g. all of the fields associated with the Aspirate command). This value will determine the field to be associated with the global value command. Only fields that match the Value type entry will be displayed. For example if the Global

Value value type is defined as Boolean then only those field values that are checkboxes or radio buttons will be displayed in the list. This reduces the amount of fields presented in the drop down list. Since the Global Value command was assigned to an Aspirate command, the associated field would give all the variables that could be altered, which include:

- Air gap volume (µl)
- Height
- Z-Axis offset (mm)
- Position, X Axis offset (mm)
- Y Axis offset (mm)
- Overstroke volume (µl)
- Overstroke return volume (µl)
- Aspirate volume (µl)
- Dwell time duration (seconds)
- Tip touch location

Once the associated field is selected, the next items in the Assign Condition section default correctly.

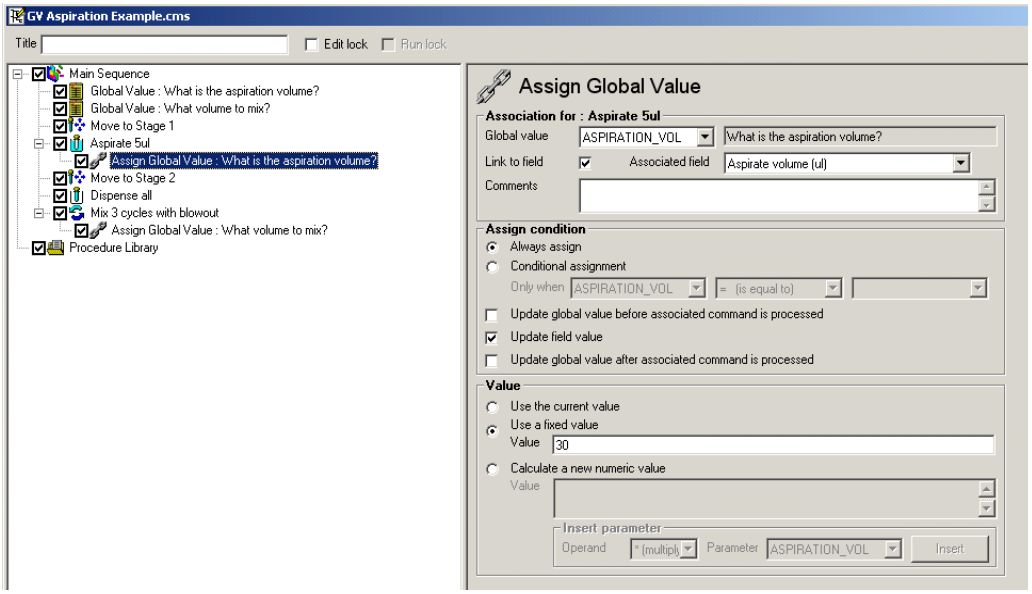
- Comments: used to annotate the Global Value Assign command for easier reading; user can provide notes to self or place comments about the global value command as a guideline



- Assign Condition: parameters default to Always assign and Update field value; values and parameters can be changed as appropriate by the user
  - Always assign: selecting this option indicates that the value is unconditionally assigned to either or both the respective field and global values specified

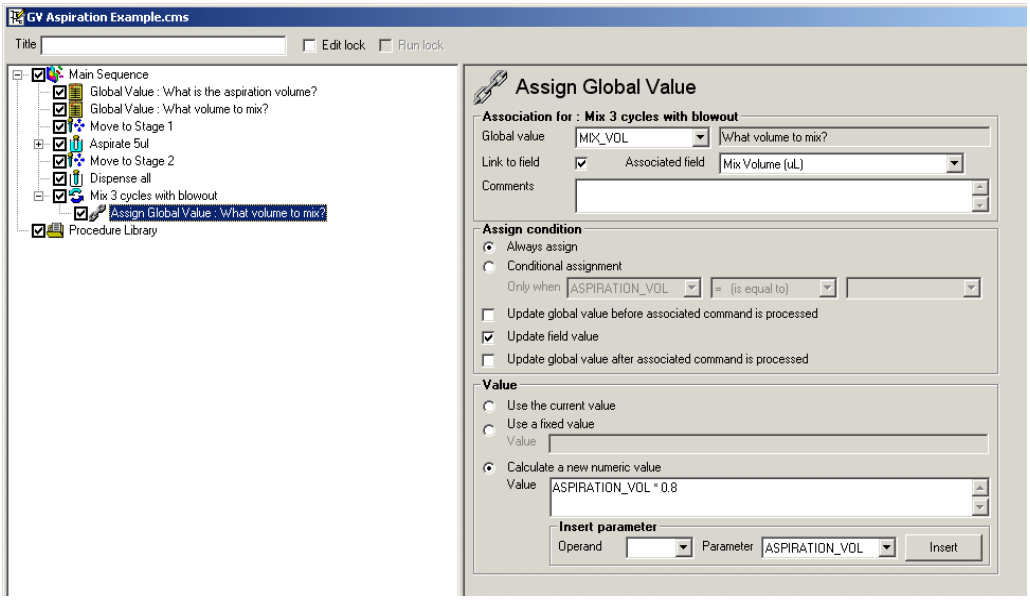
- Conditional assignment: selecting this option will only assign the value if the condition as specified in the 'Only when…' field group has been met
  - Only When: this field group is used in conjunction with the Conditional assignment field, which if set will use the field value to determine if the current global value is to be used or set. The first field allows the selection of a global value name, the second the conditional operand (e.g. 'is equal to') the last field is the conditional or trigger value which can either be another global value name or a literal value
  - drop down menu allows user to select options created from the global values created in the sequence
  - drop down menu allows user to select specific conditions
    = (is equal to)
    > (is greater than)
    < (is less than)
    <> (is not equal to)
  - drop down menu allows user to select options created from the global values created in the sequence OR enter in a numeric value
- Update: global value before associated command: is processed selecting this value uses the current field value to set the associated global value before the command is processed. This has the effect of performing any Global Value calculation to determine the new value before the associated command is processed in the sequence. If a field value is associated with this assignment then the new value will be passed to the field
- Update field value: selecting this value uses the current value of the global value to set the associated field value

- Update global value after associated command is processed: selecting this value uses the current field value to set the associated global value after the associated command has been processed. This is useful for 'passing' field values from one command to another for example barcode information etc.



- Value: parameters default to 'Use the current value'; values and parameters can be changed as appropriate by the user
  - Use the current value: selecting this field will pass the current global value to the associated field or Global Value; for example, in the Value section, "Use the current value" should always be selected unless trying to sync two or more Global Values together or when trying to sync one Global Value to two different commands, such as an aspirate and a mix cycle. Syncing commands occurs when a user would want two different parameters to change based on one Global Value. When syncing in this case, change the "value" from "use the current value" to "calculate a new numeric value".
  - Use a fixed value: selecting this field will use a literal (fixed) value to set either an associated field or global value. This is useful if the command is being used in conjunction with the 'Conditional assignment' field
    - Value: this field contains the value to be used if 'Use a fixed value' is specified; for example, if aspirating a sample and you always want to aspirate a specific value that won't change, e.g., 30uL.

Note! Entry in the "Use a fixed value" field overrides the aspirate volume used in the Aspirate step.▲



- Calculate a new numeric value: selecting this option indicates that the value to be used to set the associated field or global value is to be derived from a calculation which is specified in the associated Value field.
  - Value: this field contains the algorithm that is used to determine the new value to assign. The format uses global value names, operands and numerical values. The text can either be typed directly and/or built using the fields in the Insert parameter box; for example, after dispensing a sample and then when mixing that same sample you always want to mix a certain percentage (80%) of the sample, type in the parameter e.g., ASPIRATION_VOL*0.8
  - Insert parameter: becomes active when using the "Calculate a new numeric value"
  - Operand: this field is only available when the 'Calculate a new numeric value' option is set and is used as a helper field when building the algorithm text. Drop down menu allows user to select the common mathematical operations

    \+ (add)

    \- (subtract)

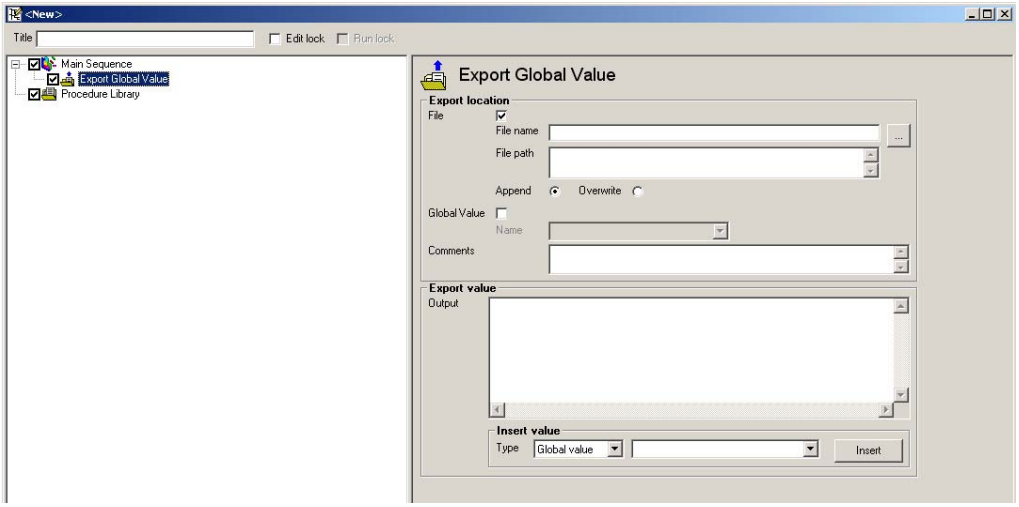
    * (multiply)

    / (divide)

  - Parameter: this field is only available when the 'Calculate a new numeric value' option is set and is used as a helper field when building the algorithm text. Drop down menu allows user to select options created from the global values created in the sequence

– Insert button: this button is only active when the ‘Calculate a new numeric value’ option is set and is used as a helper button when building the algorithm text by inserting the current values of both the Operand and Parameter fields at the current cursor location in the associated Value field. If selections are chosen from the drop down menus (Operand / Parameter) when the Insert button is clicked, the values are inserted into the Value field. These are shortcuts to automatically prefill the field as opposed to typing in the information.

Export Global Value



The Export Global Value command is used to extract information held in global values into external text based files. The format of the output is specified using this command. Any number of export commands can be added at any position within a sequence file. This allows a user to build the file export during the file execution rather than having one large export routine at the end of the sequence. The text that is output can also be ‘captured’ into another Global Value. This is useful if, for example, the text that is output to file is also required to be passed to a function via the Script File Execute command.

The file export format is determined by the user simply by building an output mask. This could include HTML or XML tags, field or record delimiters, literal text strings or any other text based information that is required to be captured to an external file.

The usage of the command is not just to build files used for importing into external databases but could also be used for example to generate reports, for example by creating HTML based files and then viewing this in a web browser.

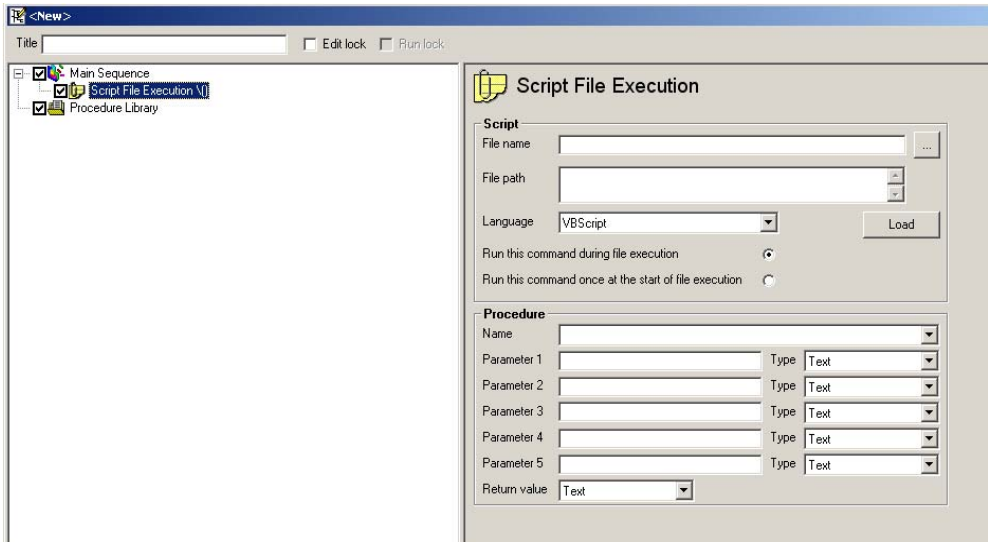
- Export location:
  - File: if selected, this checkbox is used to specify that the command should export the output text to an external file

  - File name: this field is used to specify the name of the file that will be created or updated during the export process
  - File path: This field is used to specify the name of the file directory that contains the file that will be created or updated during the export process
  - Append: Setting this option will append the data to an existing file. If the file does not exist then the a new one will be created.
  - Overwrite: Setting this option will create a new file. If the file already exists then it will be deleted and a new one of the same file name created.
- Global Value: if selected, this checkbox is used to specify that the output text is to be stored in another Global Value
  - Name: This field will be made available for selection if the Global Value checkbox has been checked. It is used to select the Global Value that is to store the output text
- Comments: used to annotate the Export location command for easier reading; user can provide notes to self or place comments about the Export location command as a guideline

- Export value:
  - Output: This field is used to determine the output mask of the data to be exported. The field allows for multiple mask lines therefore allowing for multiple information to be output from one file. The field elements can contain literal text or reserved keywords. Reserved keywords are encased within curly braces '{' and '}' and represent replaceable parameters which will contain values during file execution.
  - Insert Value:
    - Type: These helper fields are used to insert predefined text values into the Value field, at the current cursor location. The Type selection drop down list provides a filter to contents of the type of predefined value that is displayed in the adjacent drop down list.
      - Global value: helper field used to insert into the Value field, at the current cursor location, a Global Value name enclosed within curly braces { }.
      - Dynamic: helper field used to insert into the Value field, at the current cursor location, a system generated field, for example the current date, enclosed within curly braces { }.
      - Separator: helper field used to insert into the Value field, at the current cursor location, a field separator, for example a comma or tab character, enclosed within curly braces { }.
      - Line end: helper field used to insert into the Value field, at the current cursor location, a line end character (also known as a record terminator), for example a carriage return and line field sequence (CRLF), enclosed within curly braces { }.

– Insert button: clicking this button will insert the current text value of the associated predefined helper field into the Value field at the current cursor location

Script File Execution



The Script File Execution command allows the 'calling' and execution of external scripting language files. The script file can contain program source code for a specified scripting language, e.g. VBScript or JavaScript, for procedures that can perform any tasks required. An example would be a script file which connects, uses and then disconnects to an Oracle database session.

This command is fully compatible with the Global Values module. This means that any procedure within a script file requiring parameters can be passed the parameter value by utilizing the built in Global Value Assign command. This is useful, if for example, a script file contains a procedure which is used to validate a barcode. In this case the barcode would be captured into a global value and then passed as a parameter to the script file function.
Any return values, i.e. a value that is passed back from a script file function (e.g. True, False, 'OK', 100 etc.) are captured within the command and again is available for use within a global value. For barcode validation, this return value could represent whether a barcode was valid (True) or invalid (False). This could be used to make a decision to change the sequence file flow without any user intervention.

- Script
    - File name: name of the associated scripting file; the select button can be used to browse to select the required file

       button used to browse to the required file

- File path: name of the file directory for the scripting file. If the select button is used then this field is completed automatically.
- Language: used to specify the scripting language
  - VB Script
  - Microsoft J Script
  - Java Script
  - ML
- Run this command during file execution: switching on this field ensures that the script is run every time it appears within the sequence execution. This would be useful when writing data to a database after each dispense cycle.
- Run this command once at the start of file execution: setting this value ensures that the script is run only once, at the start, of file execution regardless of where the file is located within the cycle. This is useful if the script is used to extract data from a database relating to plate copies and volumes.
- Load: button used to load the procedure and function names contained in the specified file into memory

- Procedure
  - Name: a drop down field will, once the 'Load' button has been selected, present a list of the procedures and functions that are available within the specified file.
  - Parameter 1 through Parameter 5: these fields will be highlighted for each parameter argument that the selected procedure requires as input. If the procedure has no parameters then these fields are disabled and not accessible.
  - Type: used to define the parameter type
    - Numeric: whole numbers, decimals, integers (5 or 5.5)
    - Text: wording or text value; used for bar code / plate type or labware caption
    - Boolean: (True/False) represents a true / false statement
  - Return value: use this field to specify the conversion of the return value to one of either 'Text', 'Numeric' and 'Boolean (True/False)'. This ensures that the selected value integrates with modules which require values of different types, for example the Global Values module
    - Numeric: whole numbers, decimals, integers (5 or 5.5)
    - Text: wording or text value; used for bar code / plate type or labware caption
    - Boolean: (True/False) represents a true / false statement

Sequence File Editor

Command Tree

The command tree represents the program sequence. Sequence files are executed from the top to the bottom of this tree structure. Commands can be added, deleted, cut or pasted into the tree, and commands can be dragged and moved to other locations on the tree as desired.

Adding a new command

The easiest way to add a command is to click on a command icon in the Toolbox. Commands can be added in three ways:

- click the icon on the Command Toolbox
- select the command from the drop down menu on the main application toolbar
- click the right mouse button, select “add”, then select a command from the pop-up menu

Commands are added directly underneath the currently highlighted command in the command tree.

Deleting an existing command

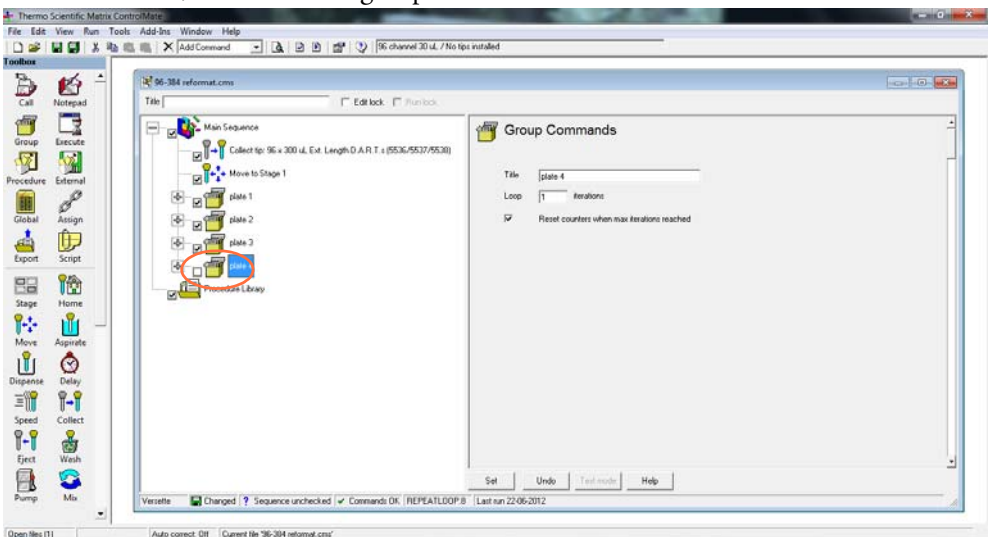
Highlight a command in the command tree then press the Delete key on the computer keyboard. A highlighted command can also be deleted by clicking the delete icon on the main application toolbar.

Moving a command

Commands can be moved to a new position in the sequence structure using the "drag and drop" method. To move a command, highlight it, then while keeping the left mouse button pressed, drag it to the new position and then release the mouse button. An alternative to dragging commands to new positions would be to use the Cut, Copy and Paste buttons, which uses the clipboard to move or copy commands.

Selective execution of commands

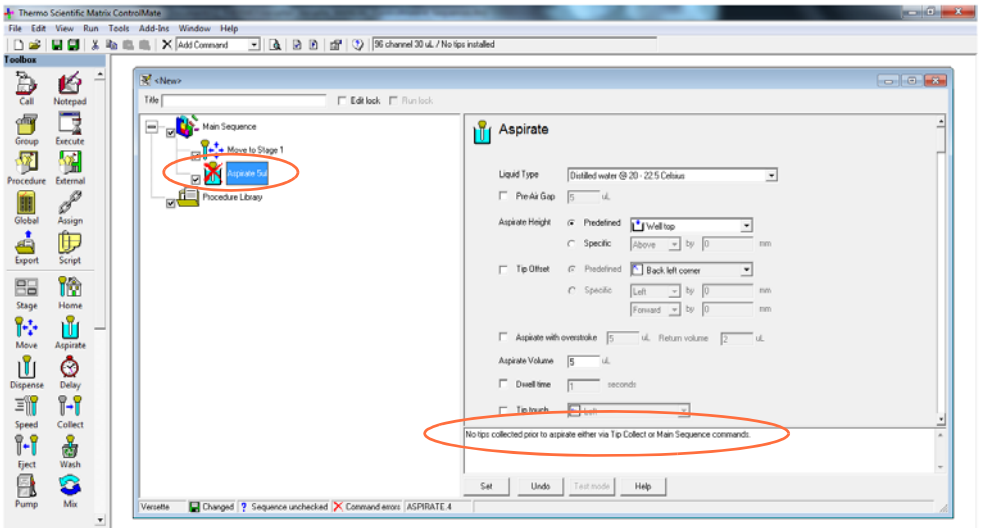
Commands can be selectively included or excluded from execution. To prevent a command from executing, check the box beside the icon of command in the tree structure. Checking (or unchecking) a group command will cause the sub-commands of that command to be checked (or unchecked). An example is shown below where the user chose to not process Plate 4 for this run, but instead of deleting the command, simply unchecked the command for this run, so that in the future, the command group can be re-checked to activate.



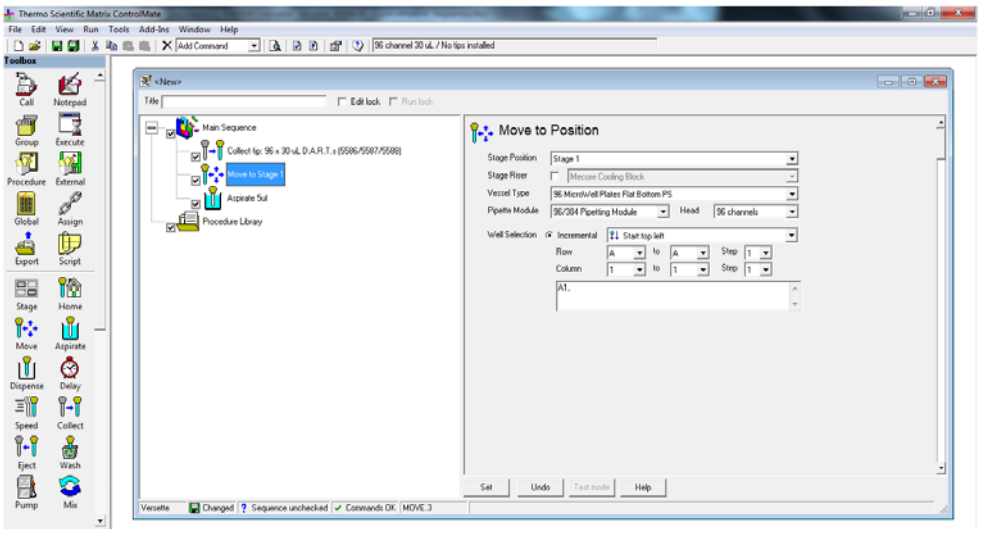
Validating a Sequence

As commands are added, the ControlMate software automatically validates each command in the command tree and will place a red “X” on any command that will not function properly and the software will list the reason why the command will fail.

An example is shown below in which a command to Aspirate 5 µl of fluid cannot be performed because no pipette tips have been installed.

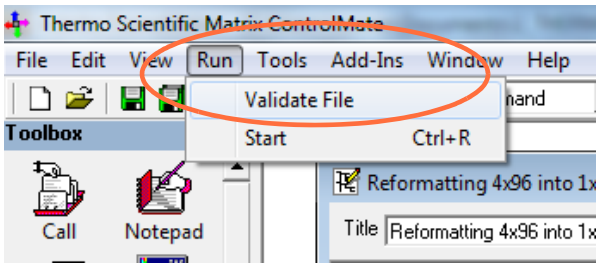


Once a tip collection command has been entered, the red “X” is automatically removed from the aspirate command:



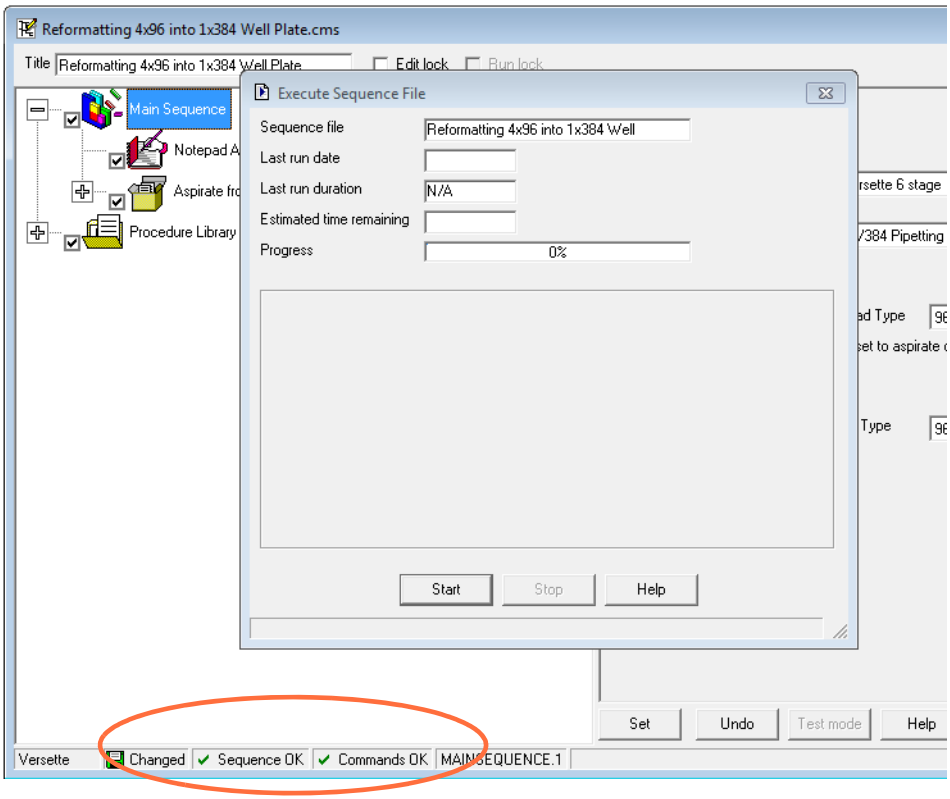
A validation check is performed by one of two ways:

1. From the "**Run**" menu, click "**Validate File**".



   The file is verified and shows any errors to correct. If no errors are present, no errors are listed in the window. Close the window.

2. From the "**Run**" menu, click "**Start**".



   The file is verified and shows any errors to correct. Correct errors as appropriate. If no errors are present than it continues to open the run sequence window to start and run the protocol, as shown above.

Sample Pipetting Sequences

The following example 'tutorials' walk through the creation of a various sample pipetting sequences, beginning with a simple dispense and working up to more advanced sequences including plate reformatting, serial dilution, and use of Global Variables in two advanced sequences.

Example Sequence 1: Basic Aspirate and Dispense

The following example walks through the creation of a very simple, basic aspirate and dispense program. Use this example to create sequences of your own. Additional example sequences are detailed in the following pages.

Example Sequence 1: Overview

This basic sequence of commands is summarized below:

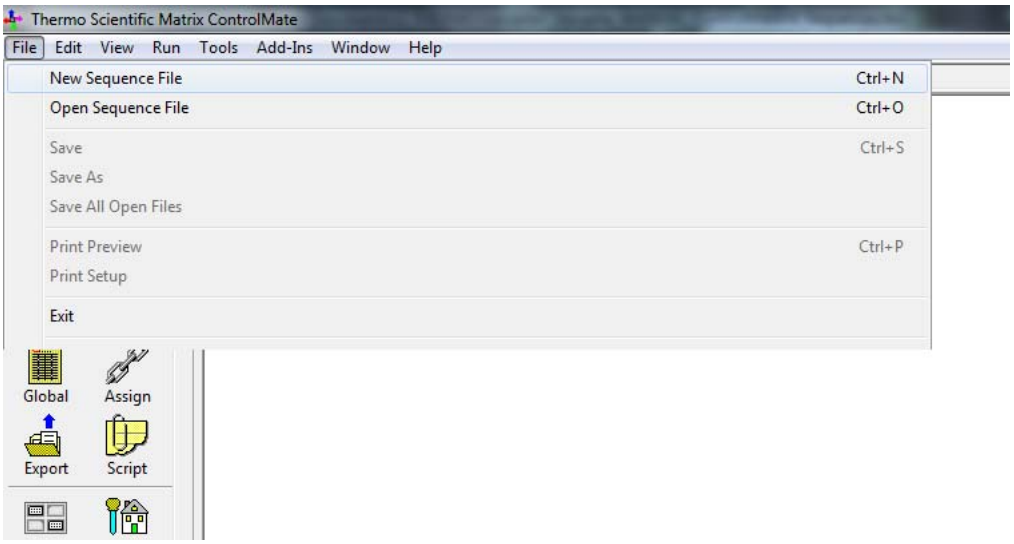
1. Verify communication and configuration of the ***Versette*** system.
2.  Home all axes
   This command will home all stage and pipetting head axes to ensure proper system operation.
3.  Collect Tips
   This command pause the system for the user to load pipetting tips.
4.  Move
   This command will be used to move to Stage 1.
5.  Aspirate
   Aspirate a set volume of liquid from the labware on Stage 1.
6.  Move
   This command will be used to move to Stage 5.
7.  Dispense
   This command will dispense a set volume of liquid in the labware on Stage 5.

Actual sequences are typically much more complex as they include multiple move and aspiration and dispense commands, and are typically modified to include any delays or other advanced liquid handling commands and options to ensure complete, precise aspiration and dispense for each liquid type. Refer to the sample sequences provided and consult Thermo Fisher Scientific with any questions.

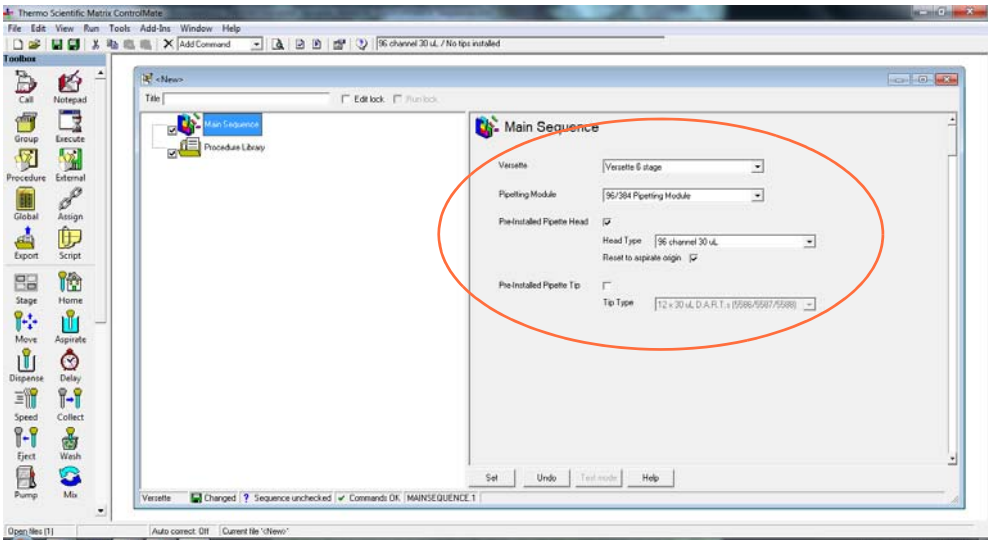
Example Sequence 1: Creation

1. Verify that communication is properly set with the ***Versette*** system, and that the configuration has been properly set. Refer to the "*Configuring ControlMate*" section of this manual for details.

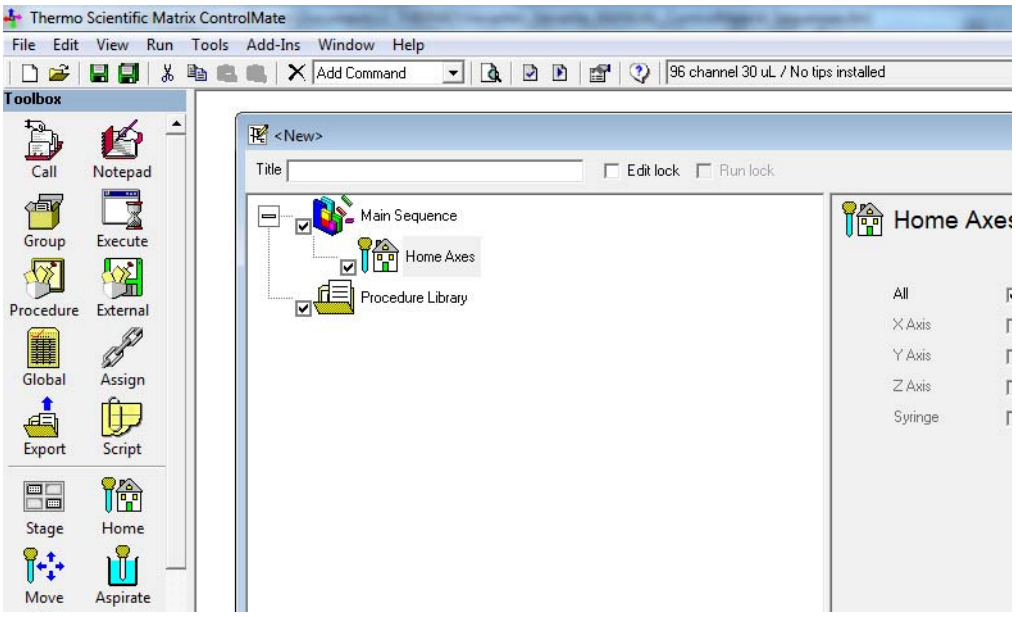
2. Select "**New Sequence File**" from the File menu or click the new sequence button on the main menu.



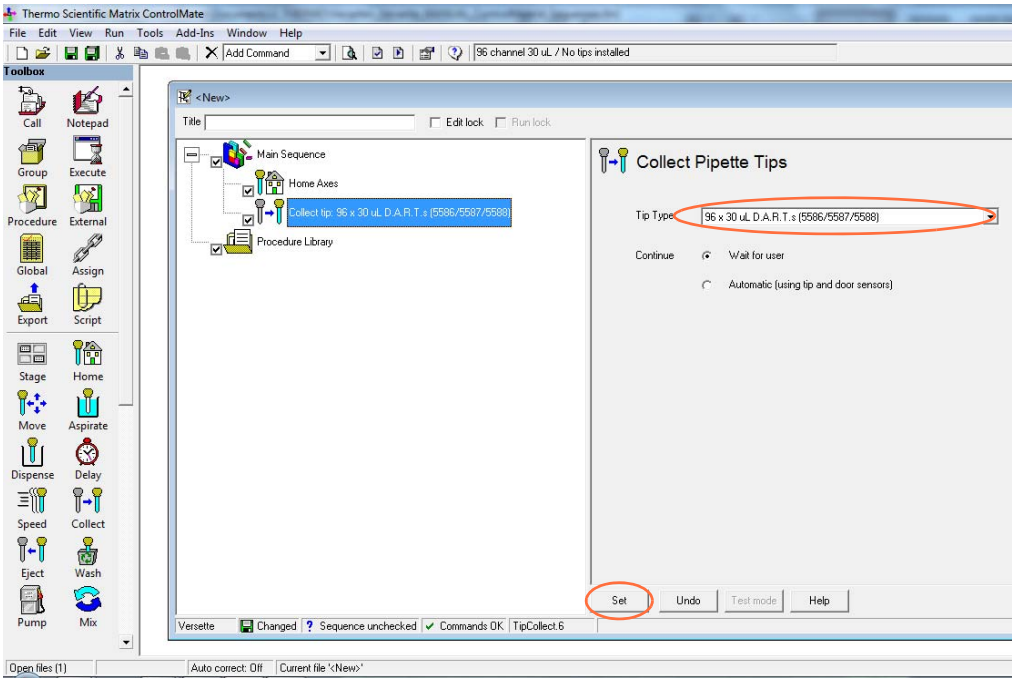
3. Under the Main Sequence command, verify the correct head and tips are selected as appropriate.



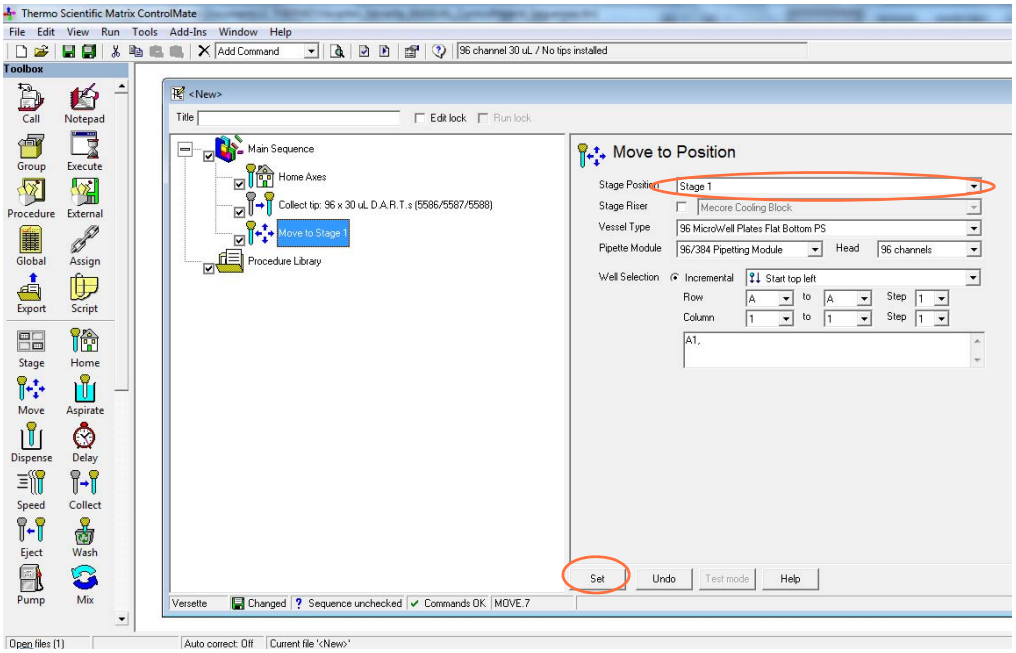
4. Click on the Home  icon to add the Home command to the sequence.



5. Click on the Collect Tips  icon then select the type of tips from the pull-down menu. Click "Set" to save the change. If there is a mismatch or other error, a message will display to alert any required action.

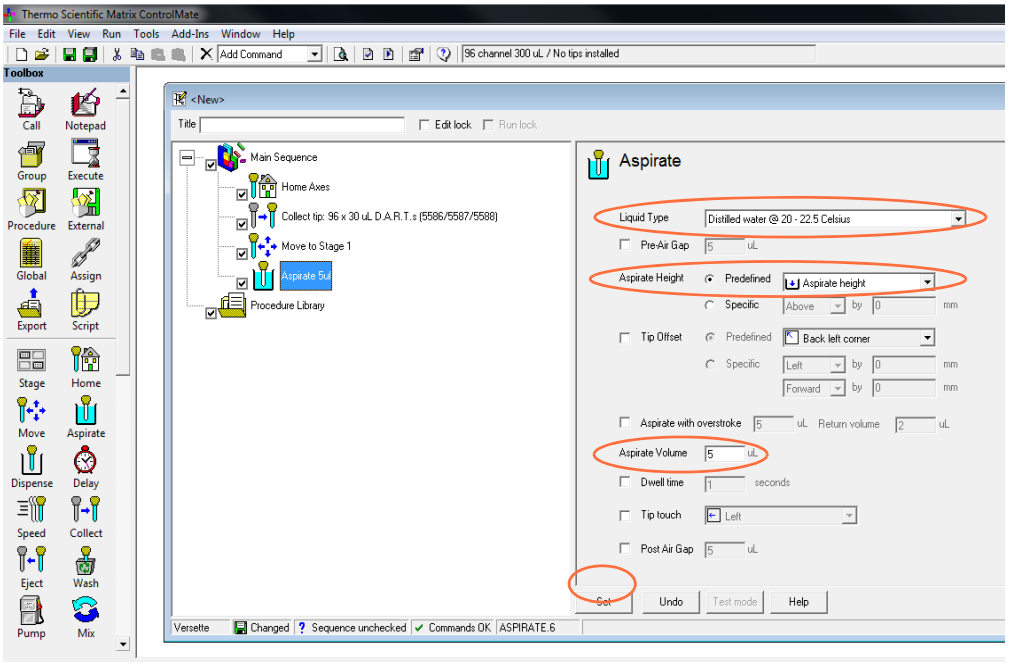


6. Click on the Move  icon then enter the stage to move to and the type of labware on the stage. In this example, we will move to Stage 1.

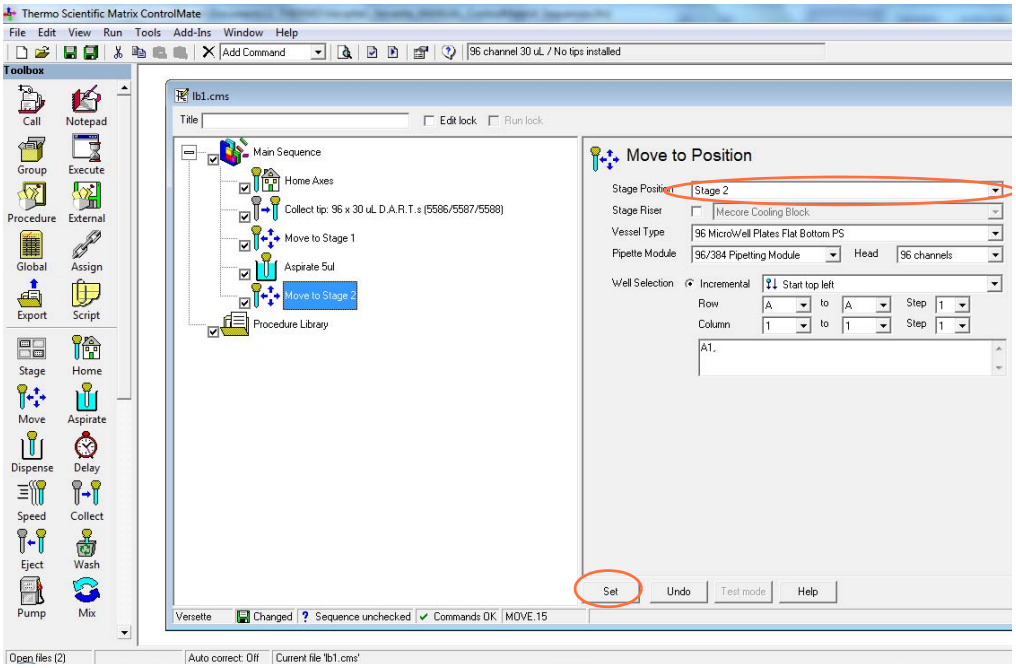


7. Click on the Aspirate  icon then select the Fluid Type, Aspirate Height, and a volume to aspirate. In this example, 5 µl of distilled water.

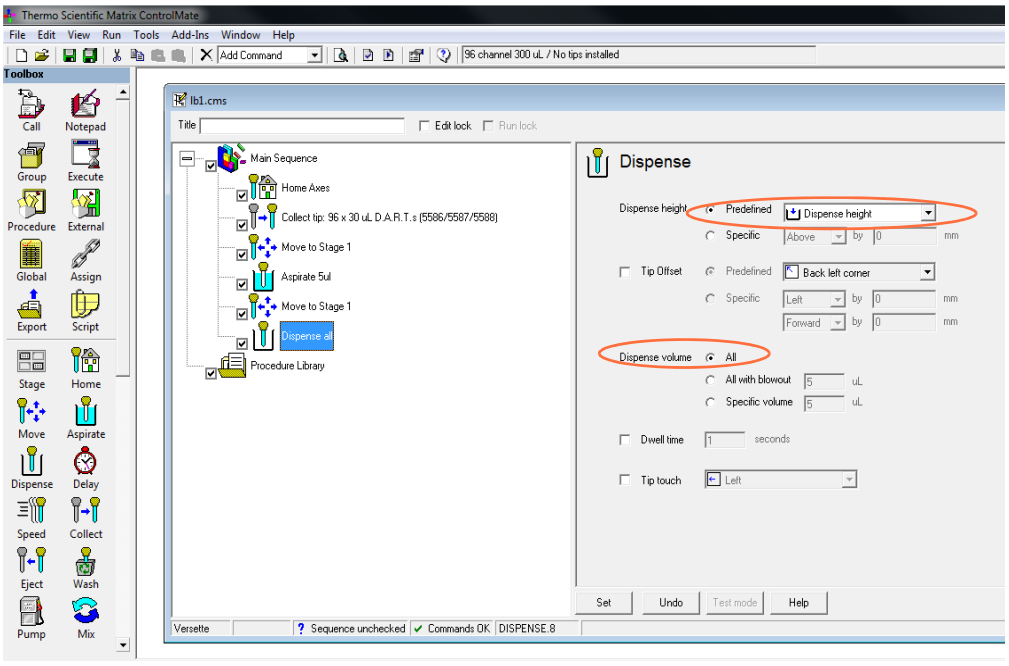
   Aspiration height refers to the distance above the base of the plate well where the pipette tip will aspirate the fluid. Typically the Aspirate Height is set at the “Aspirate height” and uses the pre-defined “Aspirate height” which is stored in the labware library.



8. Click on the Move  icon then enter the stage to move to and the type of labware on the stage. In this example, we will move to Stage 2.



9. Click on the Dispense  icon. In this example, the full volume of aspirated fluid will be dispensed at the standard “Dispense height”.



Example Sequence 2: 8/96 Serial Dilute

The following example walks through the creation of a simple serial dilute sequence. Use this example to create sequences of your own. This sequence also provides an example of executing an external application to display a message to the user, and this example introduces the use of the “Group” command.

Example Sequence 2: Overview

This basic sequence of commands is summarized below:

1. Verify communication and configuration of the ***Versette*** system.
2.  Execute external program
   This command is used to display a popup graphic message.
3.  Collect Tips
   This command will pause the system and wait for the user to load pipetting tips.
4.  Move
   This command will be used to move to Stage 5.
5.  Aspirate
   Aspirate a set volume of 50 µl of liquid from each of 8 wells from the fluid source labware on Stage 5.
6.  Group
   This command will be used to create a group of commands that will dispense fluid in a set of wells, mix the fluid in those wells, aspirate a set volume out of the wells, then move to the next column of wells and continue this cycle until the wells in entire plate has been cycled through.
7.  Move
   This command will be used to move to Stage 3.

8.  Dispense
   This command will dispense 50 µl into the first column on the plate.

9.  Mix
   This command will aspirate 80 µl of fluid from each well, then dispense back that fluid, then repeat for a total of 5 mix cycles.

10.  Aspirate
    Aspirate 50 µl from each well, then the group command will repeat for a total of 12 cycles to repeat the dispense/mix/aspirate sequence for each well in the 96-well plate.

11. Close the group (click on the '+' symbol next to the group command, will now show a "-" symbol) so that a new command, outside of the group, can be entered. The group MUST be closed to easily enter additional commands outside of the group loop.

12.  Move
    This command will be used to move to Stage 6.

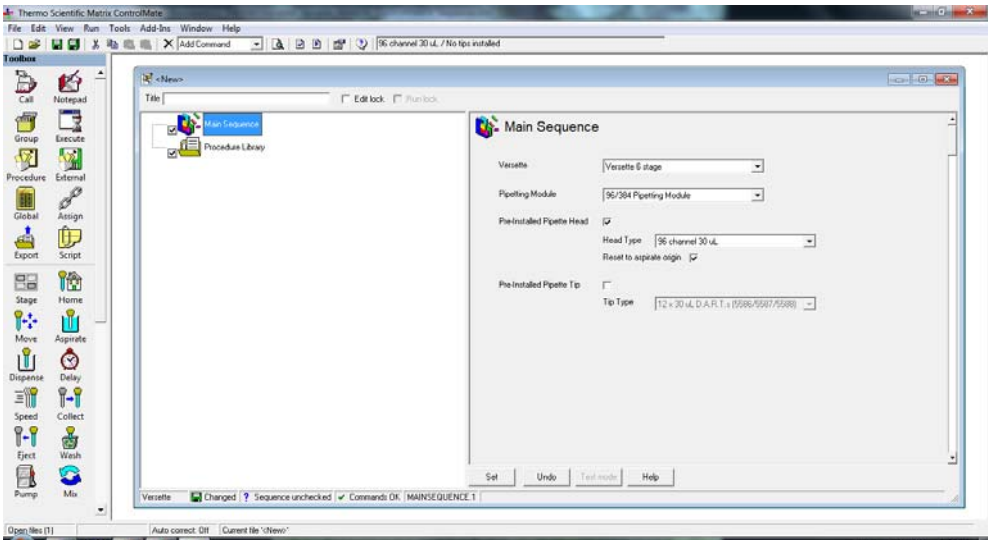
13.  Dispense
    This command will dispense all fluid out of the pipette tips.

14.  Eject pipette tips
    This command will pause the system to allow the user to remove the pipette tips.

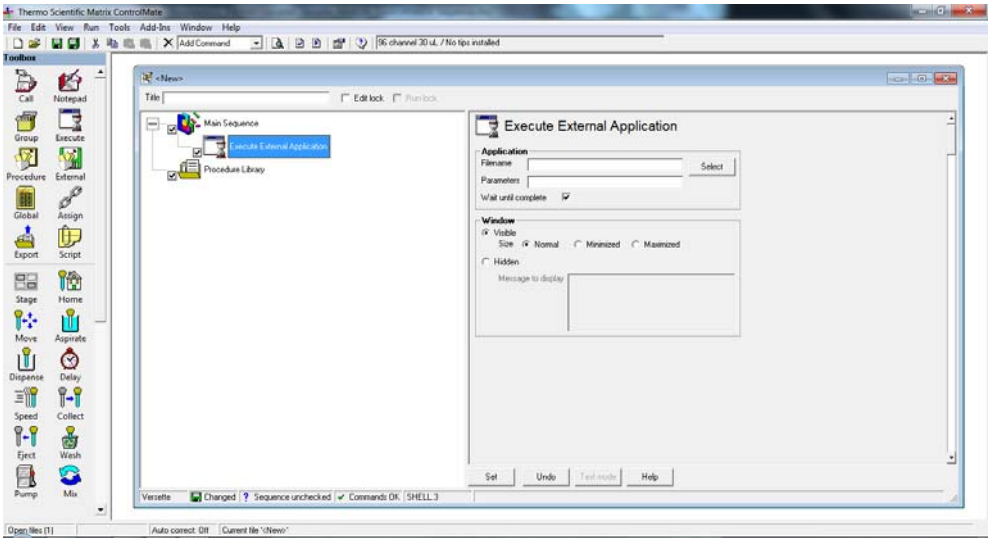
Refer to the following pages for detailed step-by-step creation of the serial dilute example program.

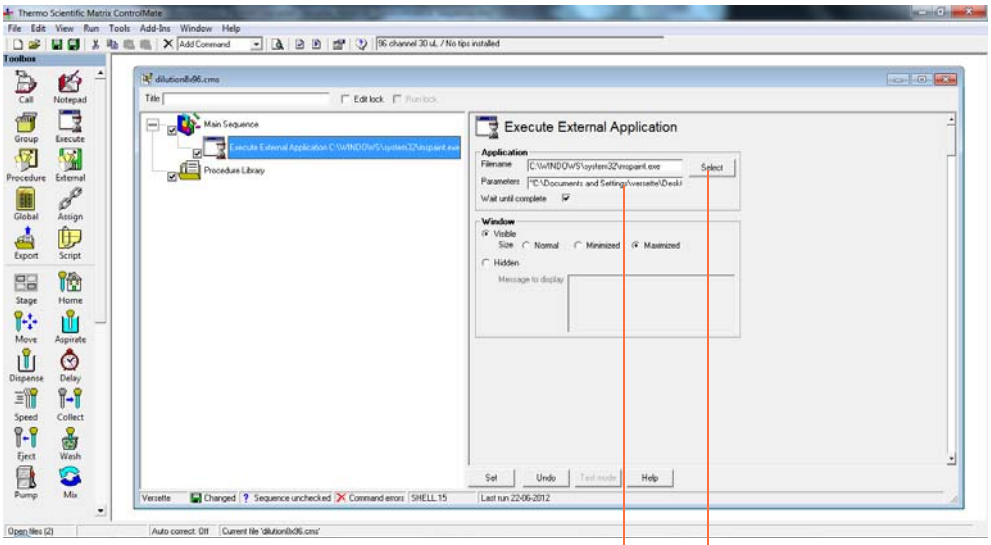
Example Sequence 2: 8/96 Serial Dilute Program Creation

1. Verify that communication is properly set with the ***Versette*** system, and that the configuration has been properly set. Refer to the "*Configuring ControlMate*" section of this manual for details.
2. Under the Main Sequence command, verify the correct head and tips are selected as appropriate.
3. Select "**New Sequence File**" from the File menu or click the new sequence button on the main menu.



4. Click on the Execute  icon to add the 'Execute External Application' command to the sequence. In this example, this command calls 'mspaint.exe' and opens a bmp file on the user's desktop to display a bmp photo that contains instructions/notes for the user.

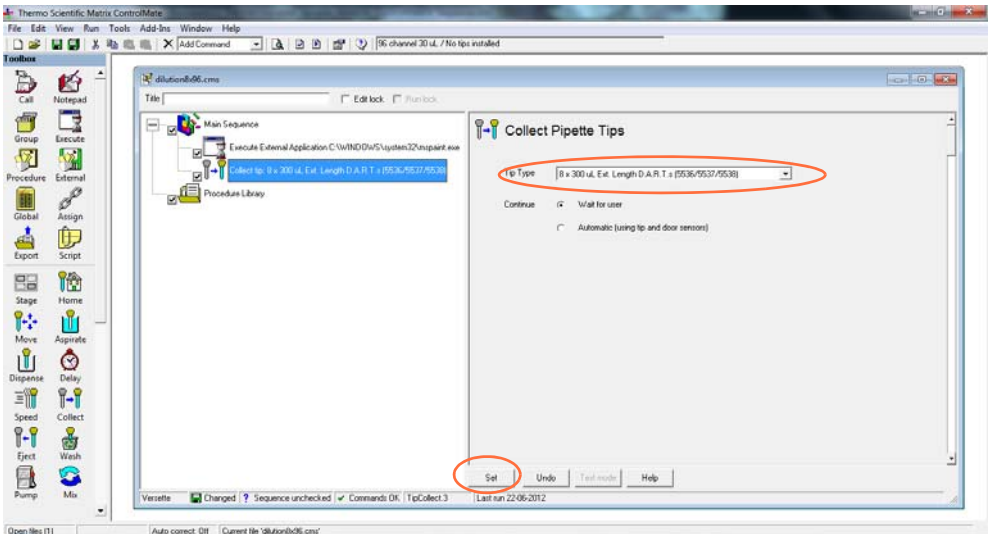




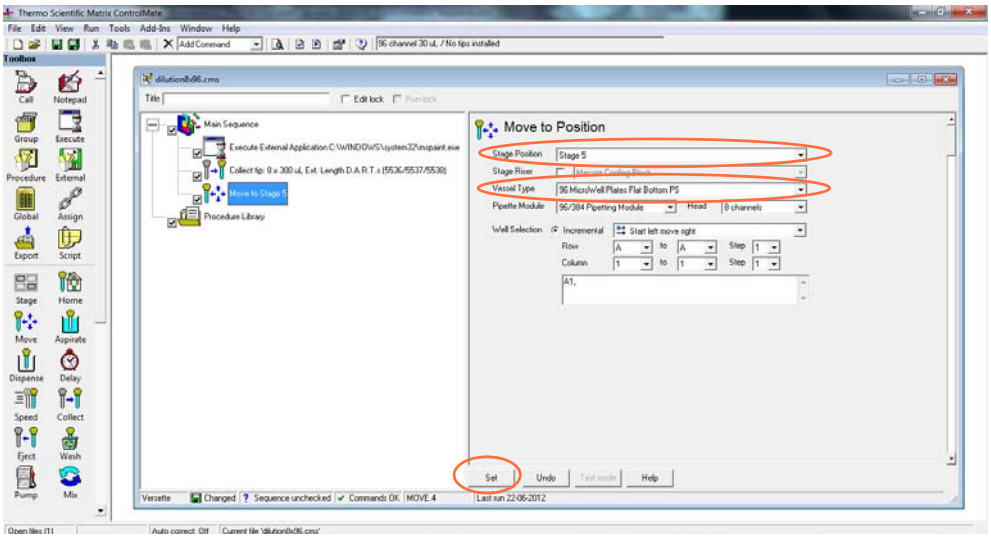
2. After selecting the application (mspaint.exe in this example) enter the full path of the graphic file to display.

1. Click "Select" then enter the full path and name of the external application. In this example, mspaint.exe

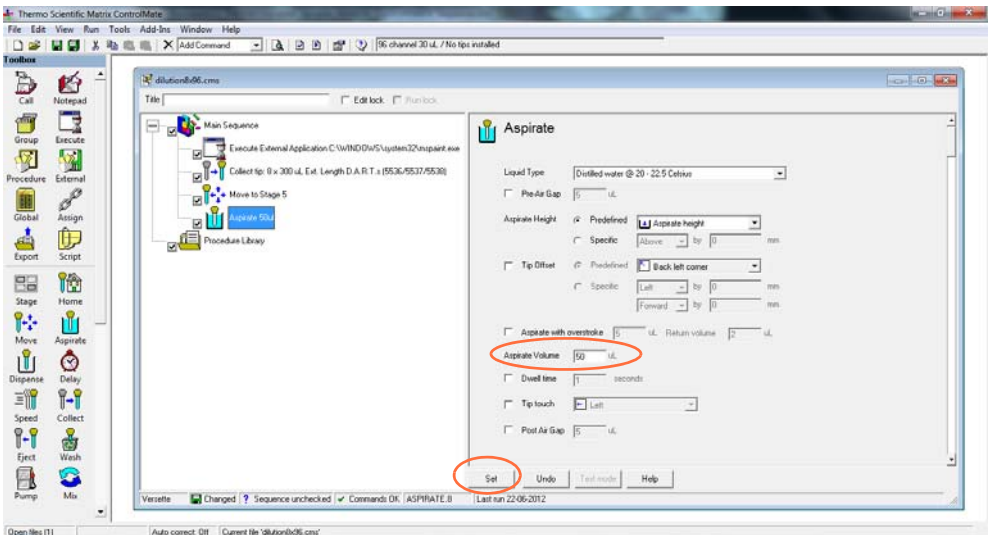
5. Click on the Collect Tips  icon then select the type of tips from the pull-down menu. Click "Set" to save the change. If there is a mismatch or other error, a message will display to alert any required action.
   In this example, the user will manually load 8 pipetting tips into a serial dilute magazine.



6. Click on the Move  icon then enter the stage to move to and the type of labware on the stage. In this example, we will move to Stage 5, so select Stage 5 and the labware noted, then select "Set".

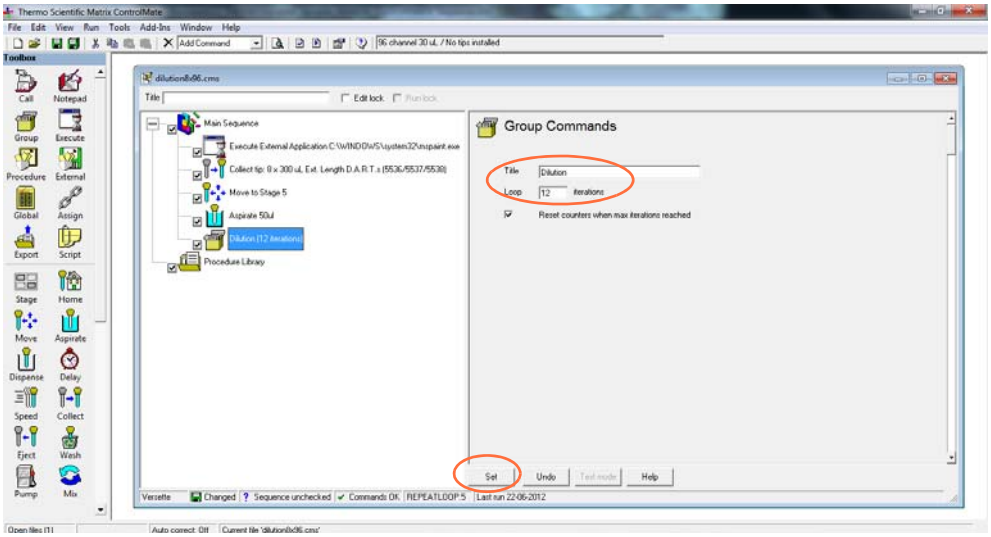


7. Click on the Aspirate  icon then select the Fluid Type and a volume to aspirate. In this example, 50 µl of distilled water.

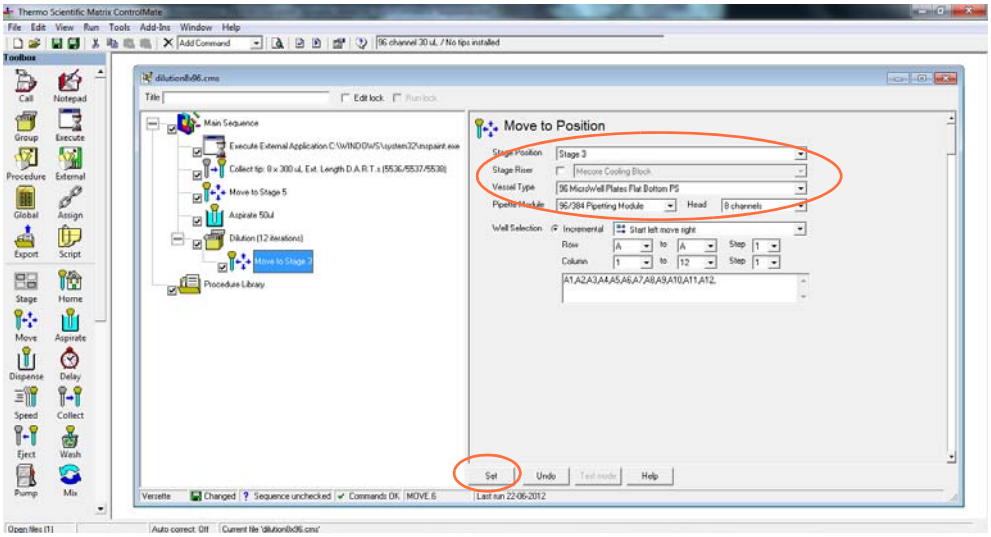


8. Click on the Group  icon then enter a Title for the group, in this example “Dilution”, then enter the number of loops, then select "Set".

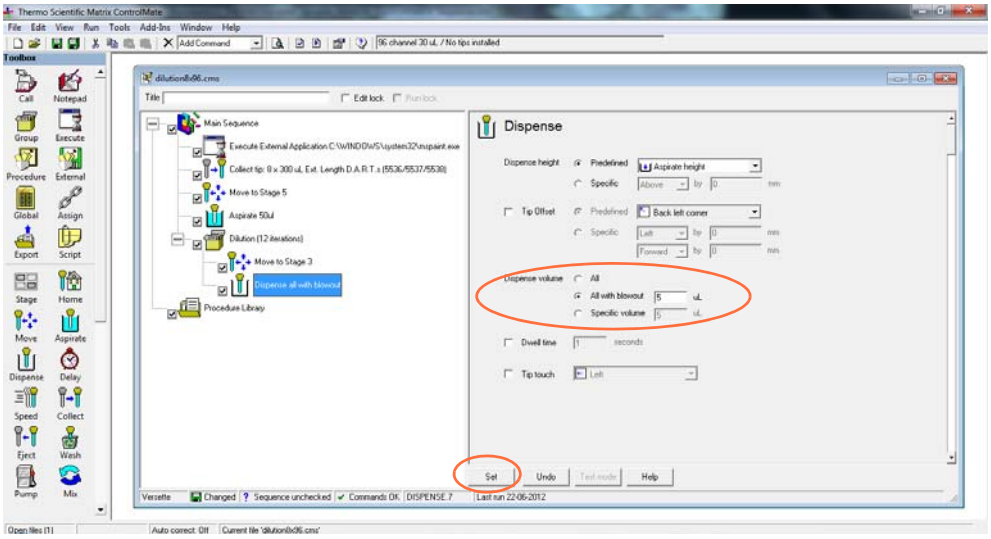
   In this example, enter 12 loops. Next, we will add commands to the group to dispense water into the first column of a 96-well plate, mix (aspirate and dispense repeatedly) in the wells on the first column, then aspirate back the dispensed volume and move to the next column and repeat this sequence for a total of 12 x 8 loops, for a total dilution of 96 wells.



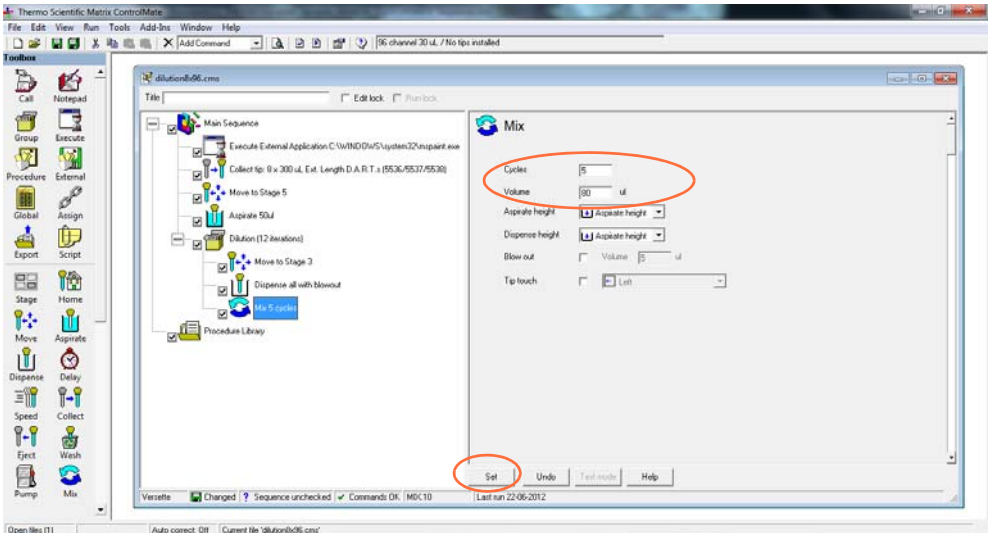
9. Click on the Move  icon then select Stage 3 and the type of labware on Stage 3, then select "Set".
   Note that the 'Well Selection' sequence is set to being at Row A, Column 1 (A1), then sequence to A2, A3, etc., as the group of commands repeats the 'loop', for a total of 12 moves (A1...A12) to cover the entire 96-well plate.



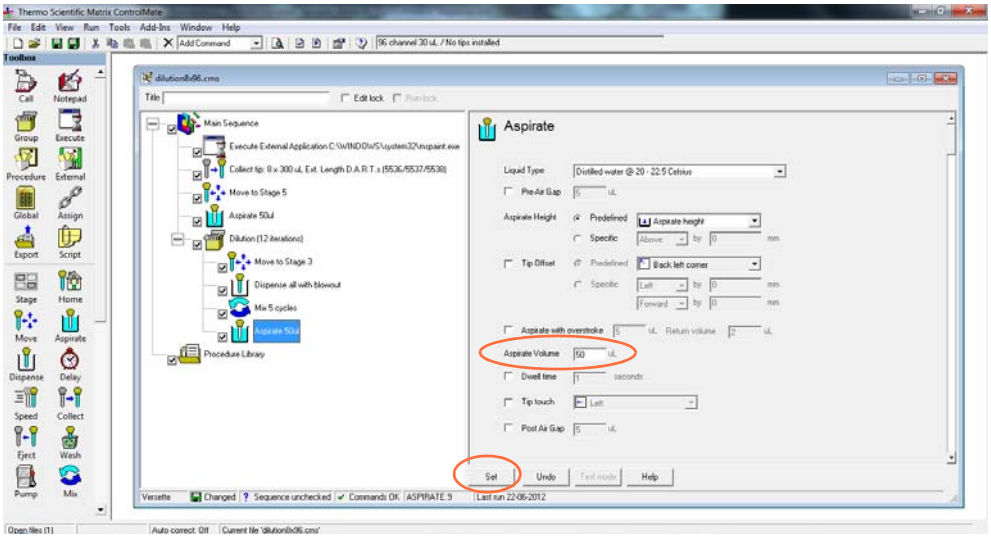
10. Click on the Dispense  icon then select 'All with blowout' for this example and add 5 µl blowout (extra-stroke) at the end of each dispense, then select "Set". This ensures a full, complete dispense of the fluid out of the pipette.



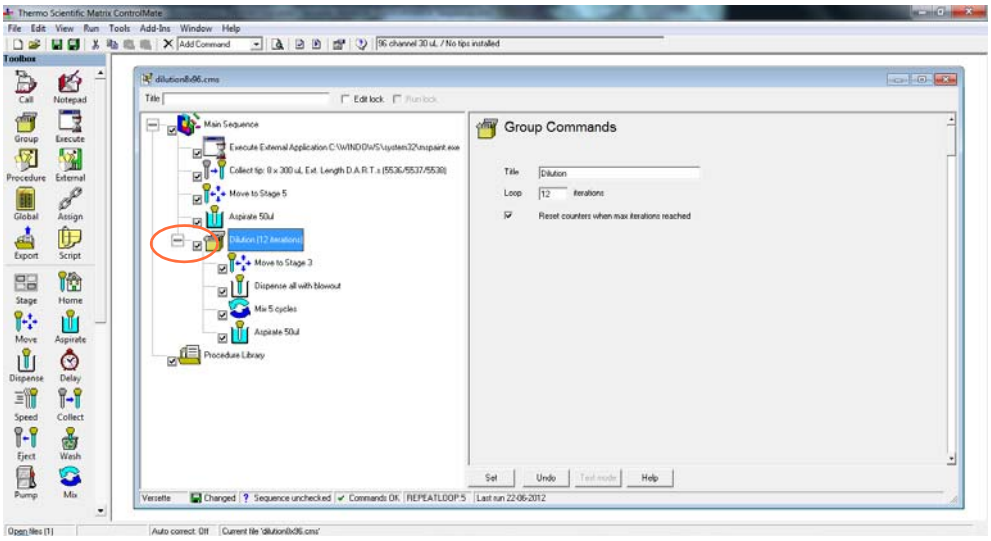
11. Click on the Mix  icon, then enter 5 for the number of mixes, and enter 80 µl for the total volume of fluid that will be aspirated and dispensed, 5 times out of and into the well, then select "Set".

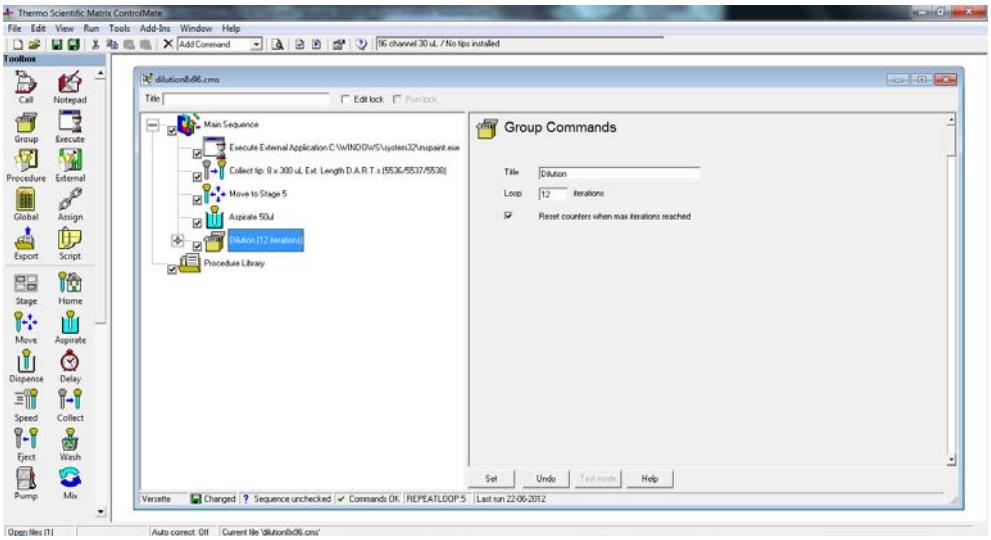


12. Click on the Aspirate  icon, then enter 50 µl to aspirate back the original amount of fluid dispensed into each well. This diluted solution will now move to the next Column in the plate, repeat the dispense/mix/aspirate cycle, and continue until all 12 columns on the plate have been diluted.

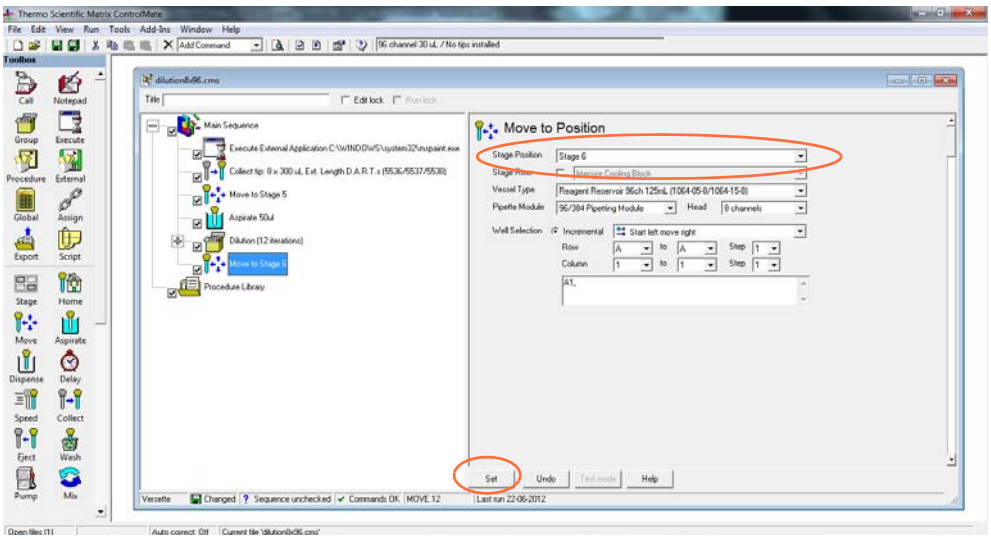


13. Close the Group by clicking on the "-" symbol next to the group.

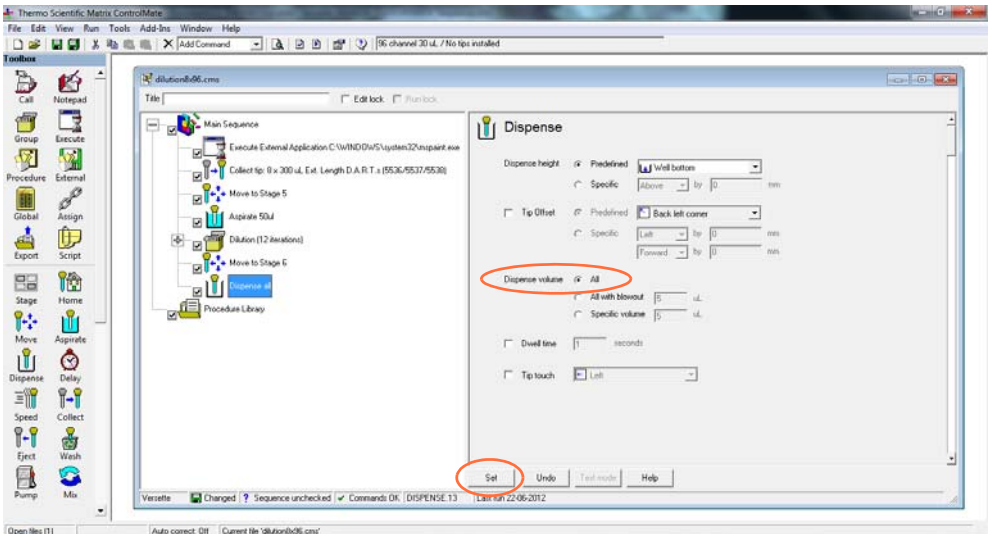




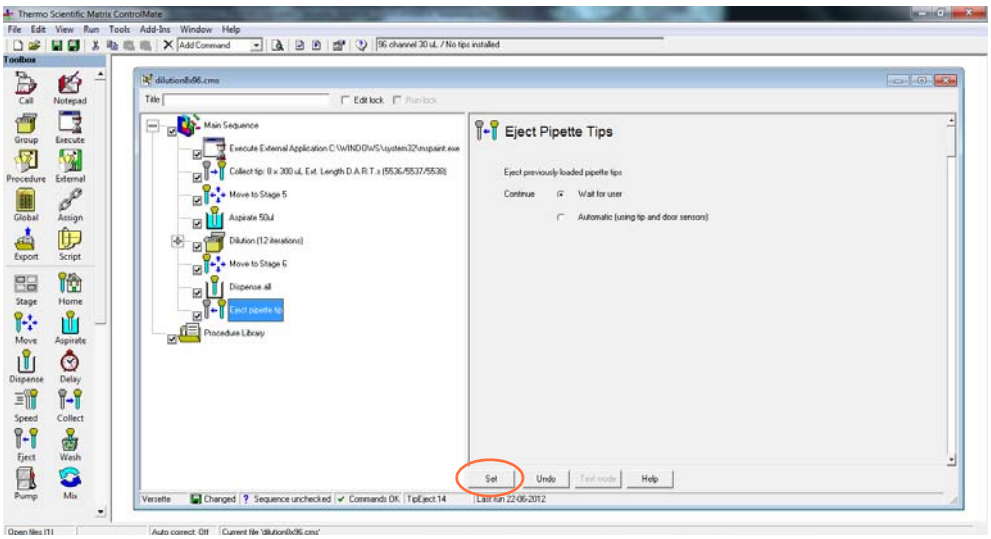
14. Click the Move  icon, then select Stage 6 (this is where we will empty the pipette tips), then click "Set".



15. Click the Dispense  icon, then select 'All'.



16. Click the Eject pipette tip  icon to pause the system and allow the user to unload the pipette tips.



Example Sequence 3: 96/384 Serial Dilute

The following example walks through the creation of a simple serial dilute sequence. Use this example to create sequences of your own. This sequence also provides an example of using the Notepad command, and uses the "Group" command to produce a loop totalling 12 iterations.

Example Sequence 3: Overview

This basic sequence of commands is summarized below:

1.  Use the Notepad command to list the stage configuration.
2.  Collect Tips
   This command pauses the system for the user to load pipetting tips.
3.  Group
   This command will be used to create a group of commands that will move to Stage 3, dispense all fluid in the tips, mix (aspirate then dispense) the fluid 3 additional times to mix the fluid, then aspirate 20 µl of fluid.
4.  Move
   This command will be used to move to Stage 3.
5.  Dispense all
   This command will dispense all fluid.
6.  Mix 3 cycles
   This command will aspirate 30 µl of fluid from each well, then dispense back that fluid, then repeat for a total of 3 mix cycles.
7.  Aspirate
   Aspirate 20 µl from each well, then the group command will repeat for a total of 12

cycles to repeat the dispense/mix/aspirate sequence for each well in the 96-well plate. The sequence will move from Row A, Column 1 to Row A, Column 12.

8. Close the group (click on the '+' symbol next to the group command, will now show a "-" symbol) so that a new command, outside of the group, can be entered. The group MUST be closed to easily enter additional commands outside of the group loop.

9.  Move
This command will be used to move to the Reagent Reservoir on Stage 2.

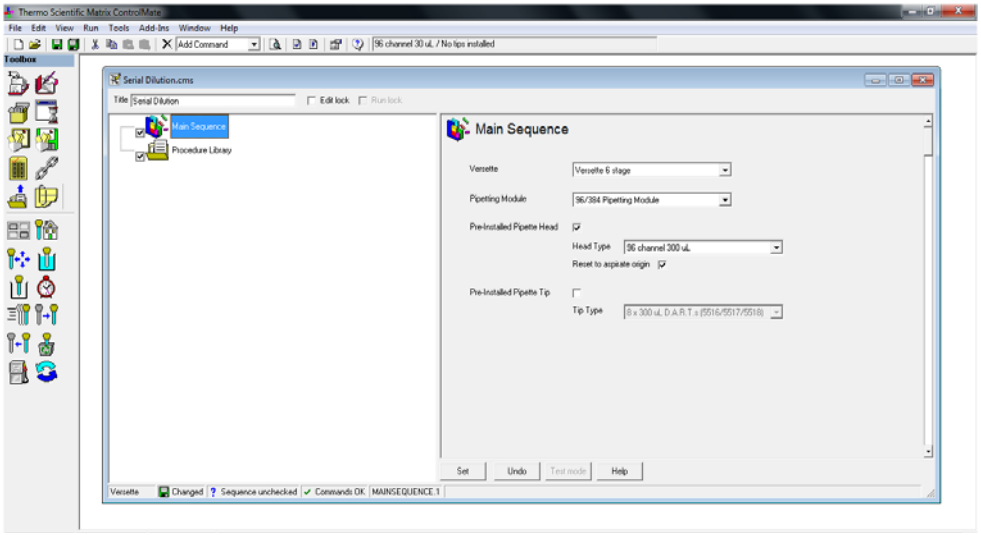
10.  Dispense all with blowout
This command will dispense all fluid out of the pipette tips.

11.  Eject pipette tips
This command will pause the system to allow the user to remove the pipette tips.

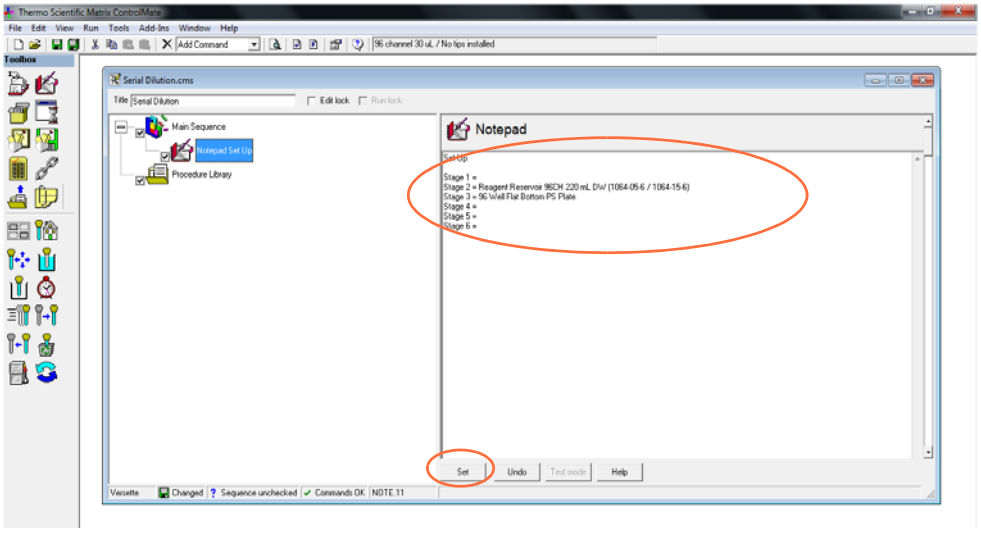
Refer to the following pages for detailed step-by-step creation of the serial dilute example program.

Example Sequence 3: 96/384 Serial Dilute Program Creation

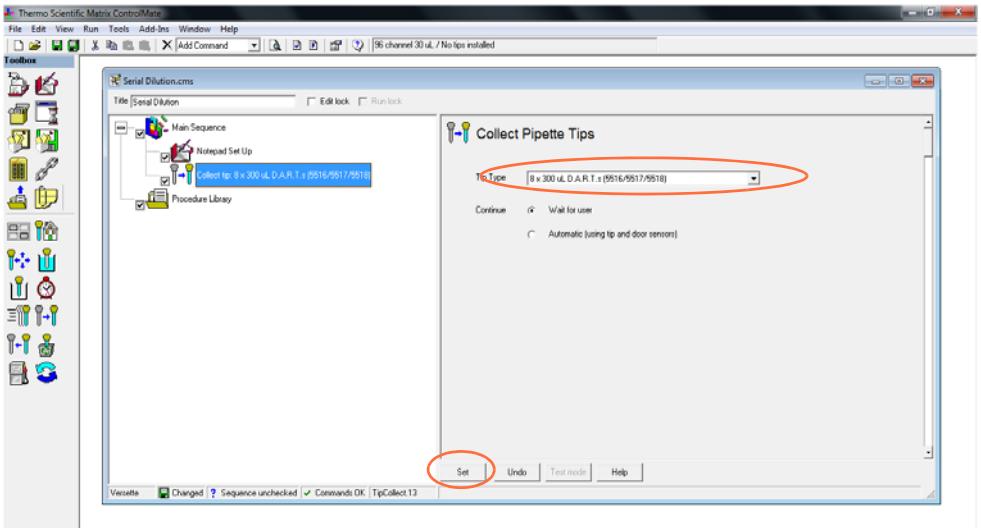
1. Verify that communication is properly set with the ***Versette*** system, and that the configuration has been properly set. Refer to the "*Configuring ControlMate*" section of this manual for details.
2. Under the Main Sequence command, verify the correct head and tips are selected as appropriate.
3. Select "**New Sequence File**" from the File menu or click the new sequence button on the main menu.



4. Click on the Notepad icon then enter the configuration notes for the stage layout. The example is shown below.

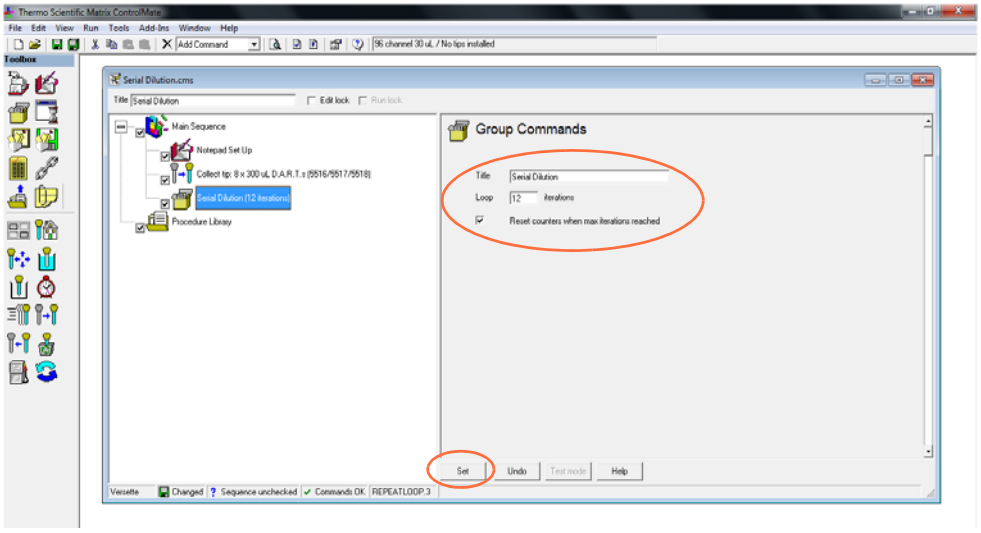


5. Click on the Collect Tips  icon then select the type of tips from the pull-down menu. Click "Set" to save the change. If there is a mismatch or other error, a message will display to alert any required action.

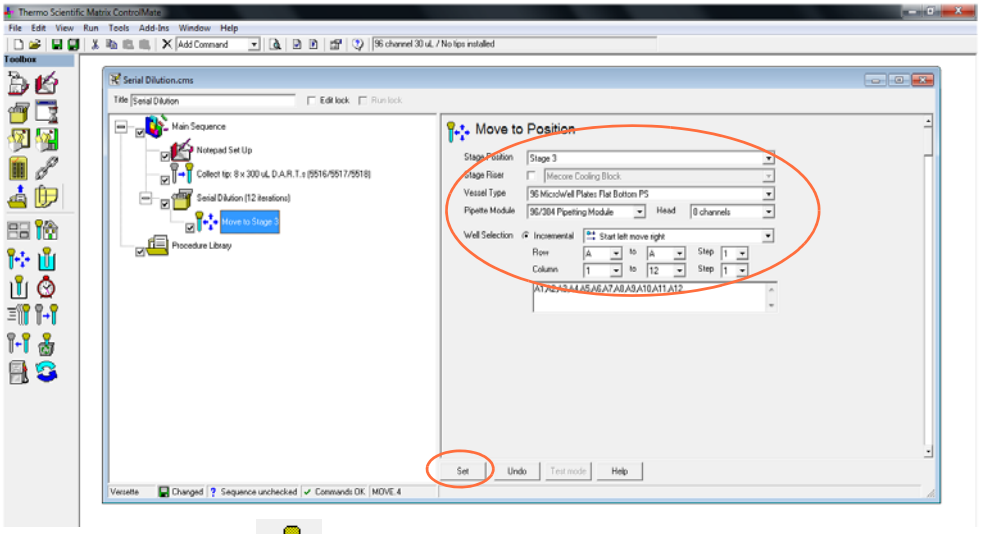


6. Click on the Group  icon then enter a Title for the group, in this example “Dilution”, then enter the number of loops, then select "Set".

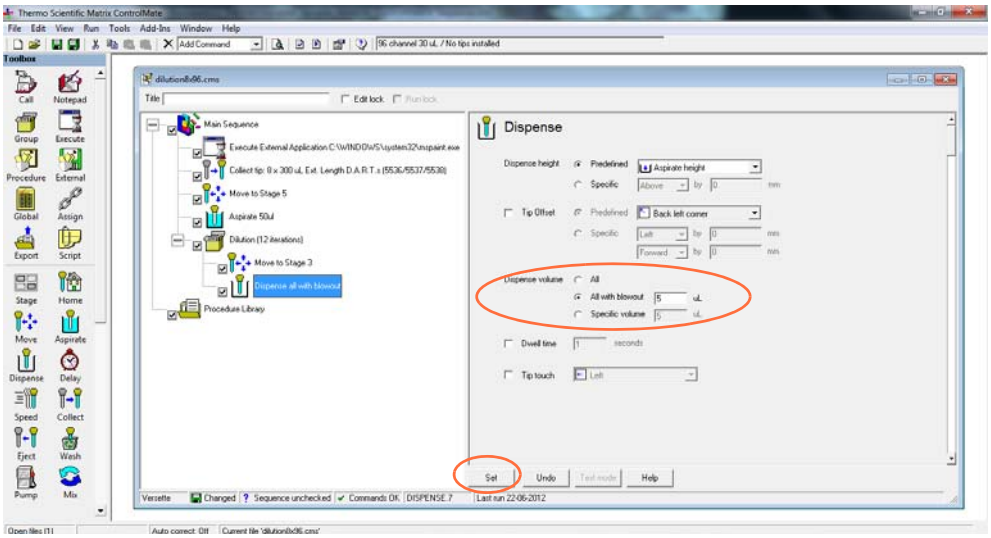
   In this example, enter 12 iterations (loops).



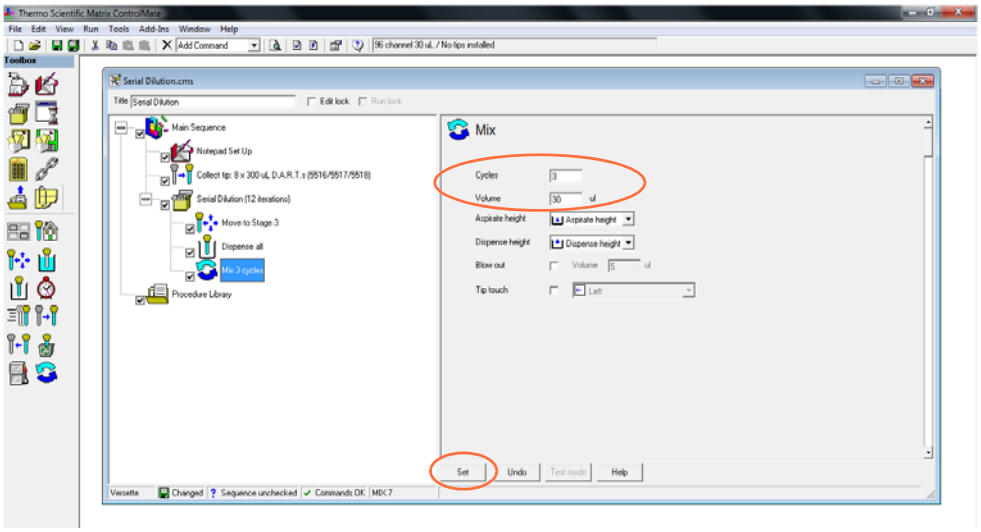
7. Click on the Move  icon then enter the stage to move to and the type of labware on the stage. In this example, we will move to Stage 3, so select Stage 3 and the labware noted. Select “Incremental” by selecting “Start left move right” from the Well Selection pull-down, then Enter the Row and Columns, as noted: From Row A Column 1 to Row A Column 12. Set the Step to “1” to not skip over any wells, then select "Set".



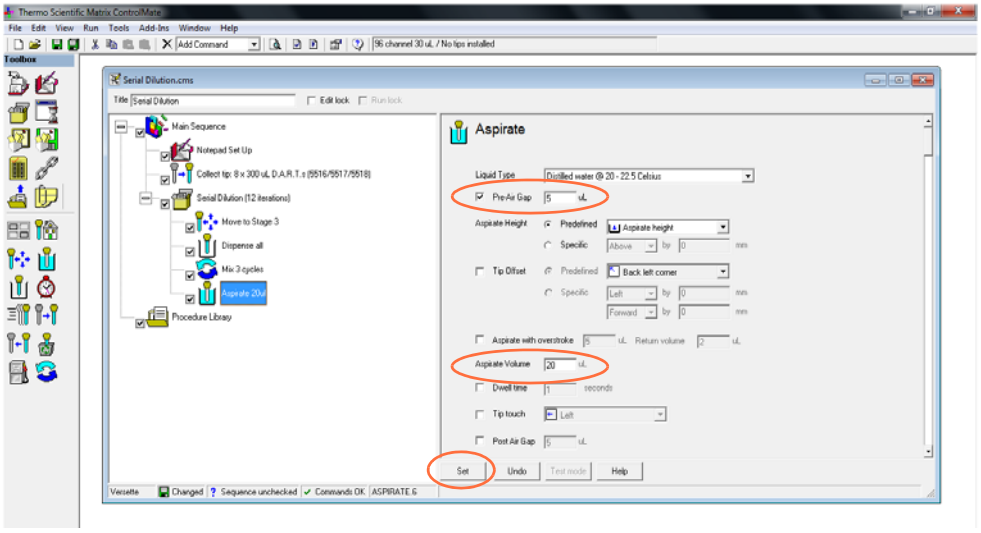
8. Click on the Dispense  icon then select ‘All with blowout’, enter 5 µl for blowout, then select "Set". For the first loop, no actual fluid will be dispensed, but for each subsequent loop, the fluid in the pipettes will be dispensed.



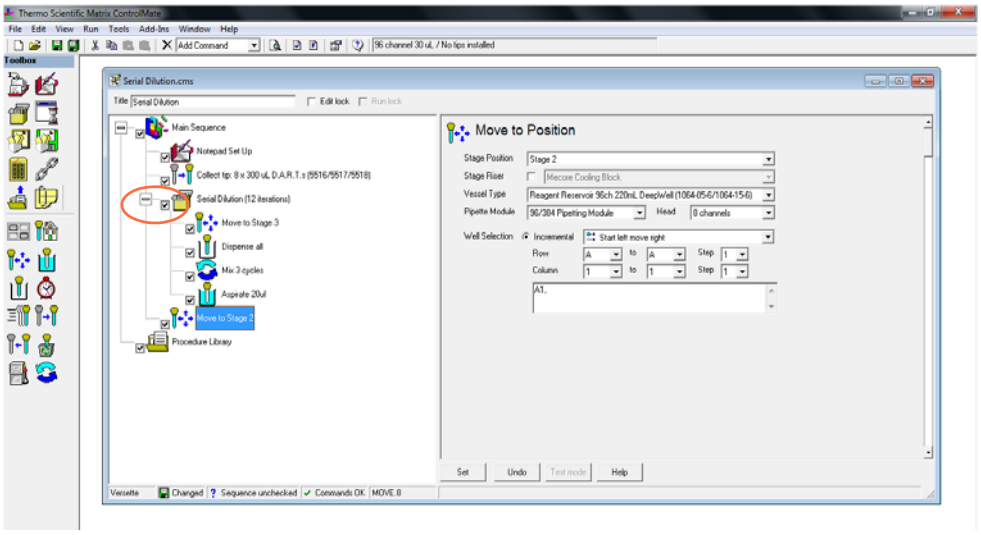
9. Click on the Mix  icon, then enter 3 for the number of mixes, and enter 30 µl for the total volume of fluid that will be aspirated and dispensed, 3 times out of and into the well, then select "Set".

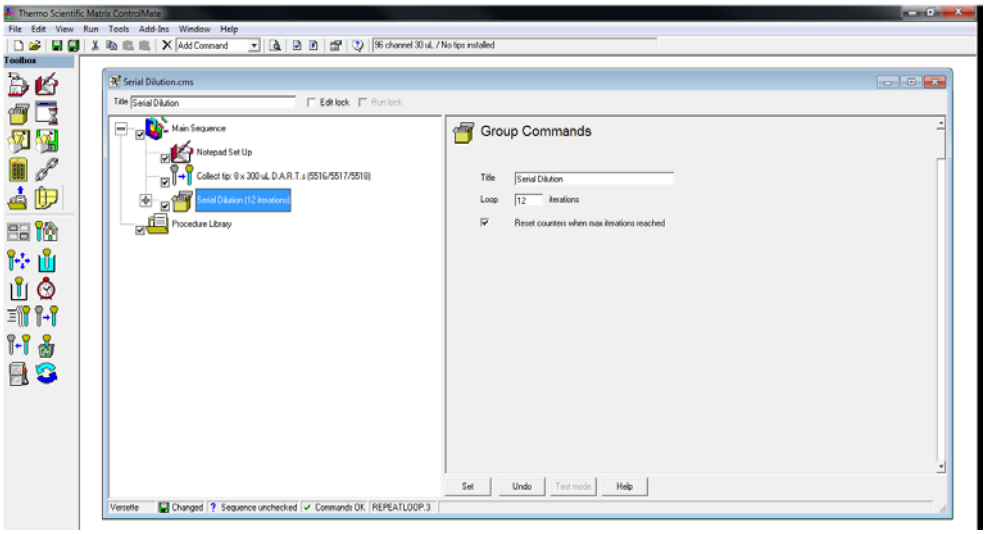


10. Click on the Aspirate  icon, then enter a Pre-Air Gap of 5 µl (see Pre-Gap command), then enter an Aspirate volume of 20 µl to aspirate back 20 µl of fluid dispensed into each well. This diluted solution will now move to the next Column in the plate, repeat the dispense/mix/aspirate cycle, and continue until all 12 columns on the plate have been diluted.

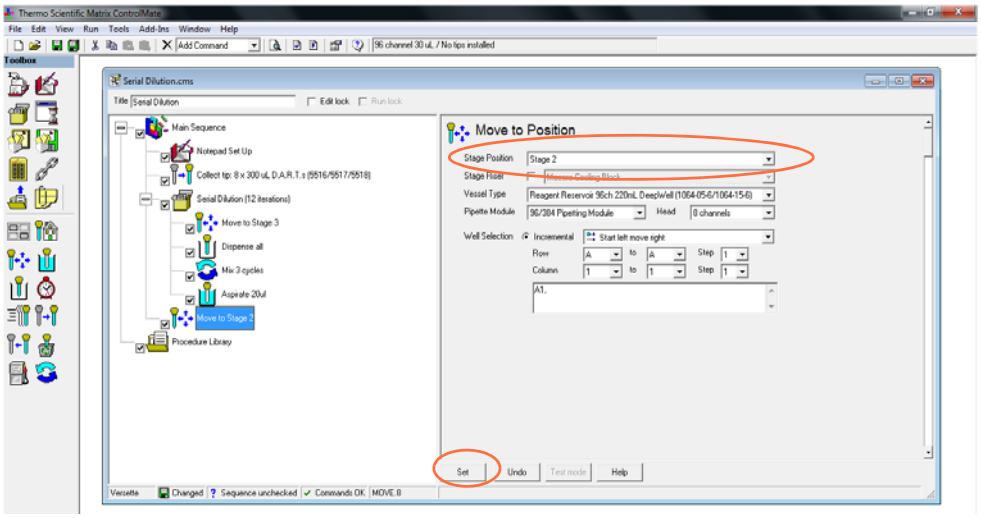


11. Close the Group by clicking on the "-" symbol next to the group.

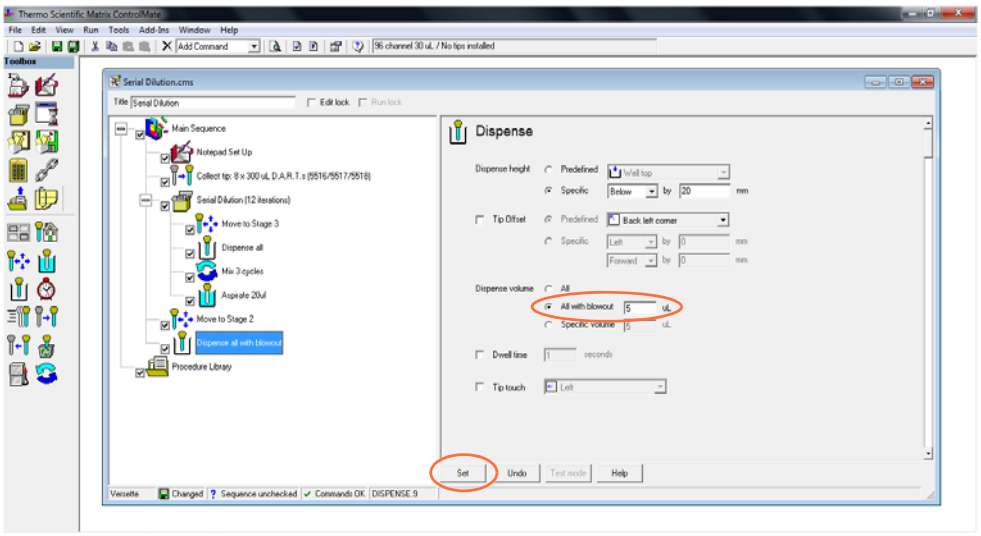




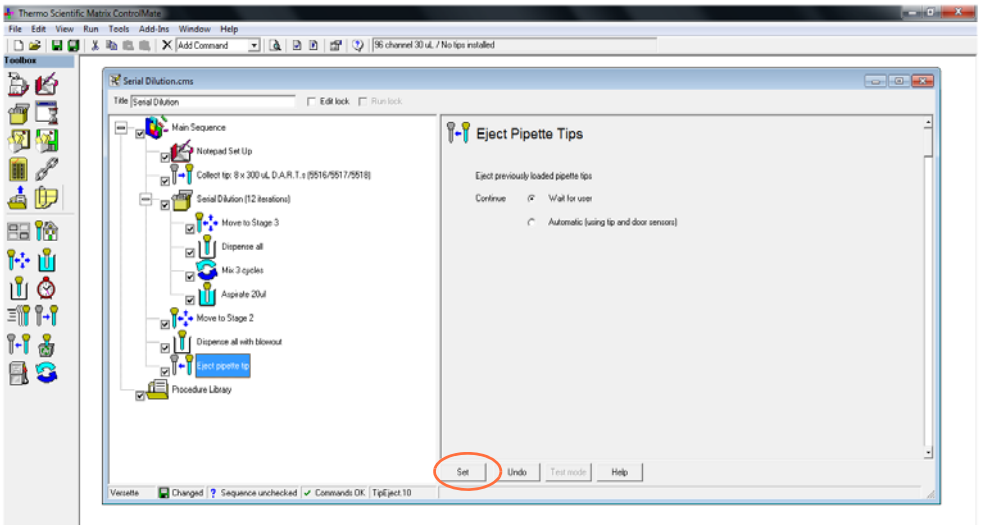
12. Click the Move  icon, then select Stage 2 (this is where we will empty the pipette tips), then click "Set".



13. Click the Dispense  icon, then select 'All with blowout' and enter 5 µl (the typical default for blowout to drive the dispense motor the equivalent of an extra 5 µl of volume to ensure all fluid is removed from the pipettes. Select "Set".



14. Click the Eject pipette tip  icon to pause the system and allow the user to unload the pipette tips.



Example Sequence 4: Plate Reformatting

The following example walks through the creation of a simple plate reformatting sequence. In this sequence, there are four sample fluids located in each of the 96-well plates which are located on stages 1, 3, 4, and 5. A 384 well plate (the 'destination plate') will be placed on Stage 6. A Tip Wash Station will be placed on Stage 2. The sequence consists of aspirating fluid from each source and dispensing that fluid onto the appropriate quadrants in the destination plate, and completing a tip wash cycle between each fluid transfer, to ensure the tips are clean and do not cross-contaminate the fluids in each of the four source plates.

Example Sequence 4: Overview

The reformatting sequence example makes extensive use of two commands: the Group command and the Call Procedure Command.

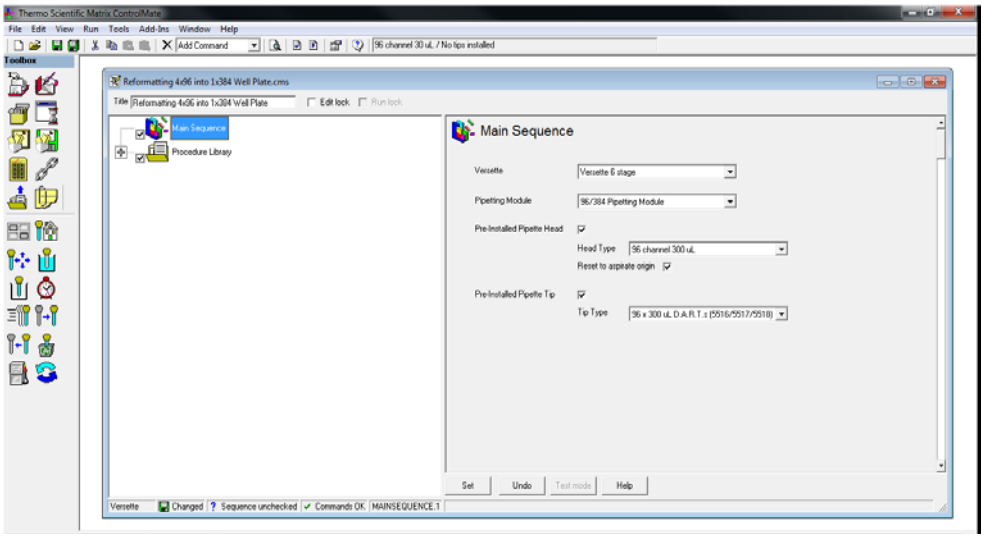
The Group command will be used extensively to create Aspirate and Dispense sequences as follow:
Aspirate from Stage 1 (Sample 1) then Dispense to Stage 6 Quadrant 1
Aspirate from Stage 3 (Sample 2) then Dispense to Stage 6 Quadrant 2
Aspirate from Stage 4 (Sample 3) then Dispense to Stage 6 Quadrant 3
Aspirate from Stage 5 (Sample 4) then Dispense to Stage 6 Quadrant 4

The Call Procedure Command is used between each dispense operation to call a tip washing procedure from the Procedure Library. Rather than re-writing the move and wash sequence, for each of the four samples, the procedure is written just once (Move to the wash station on Stage 2, then Wash Tips 5 Wash Cycles with Blow Out).

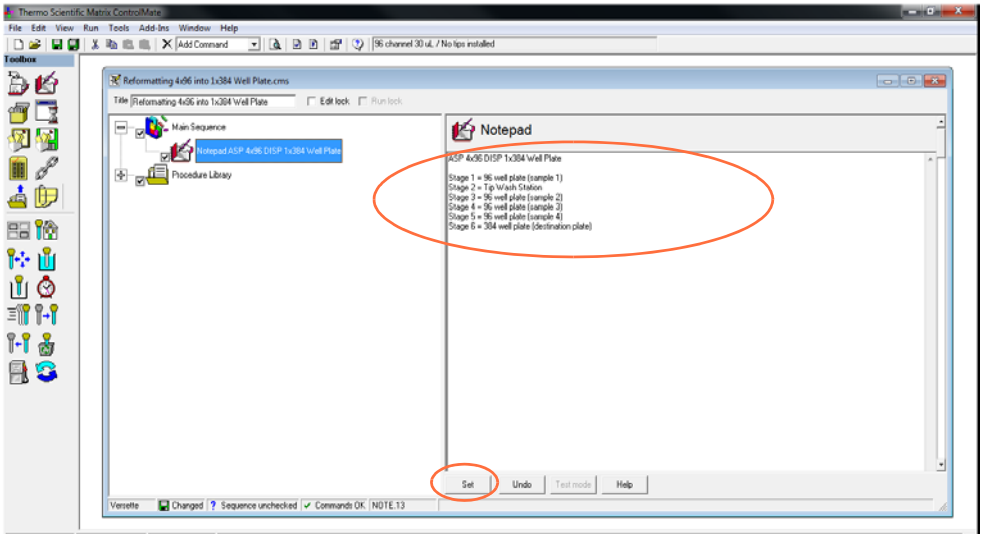
Refer to the previous examples and sections of this manual for details on command and screen options which are summarized on the following pages for this reformatting sequence.

Example Sequence 4: Plate Reformatting Program Creation

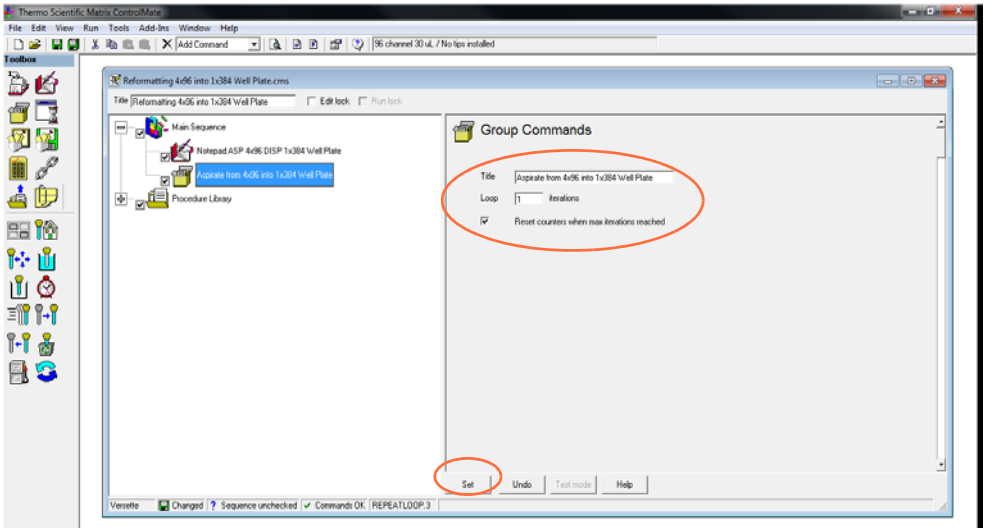
1. Verify that communication is properly set with the ***Versette*** system, and that the configuration has been properly set. Refer to the "*Configuring ControlMate*" section of this manual for details.
2. Under the Main Sequence command, verify the correct head and tips are selected as appropriate. This sequence assumes that pipette tips are already loaded into the system.
3. Select "**New Sequence File**" from the File menu or click the new sequence button on the main menu.



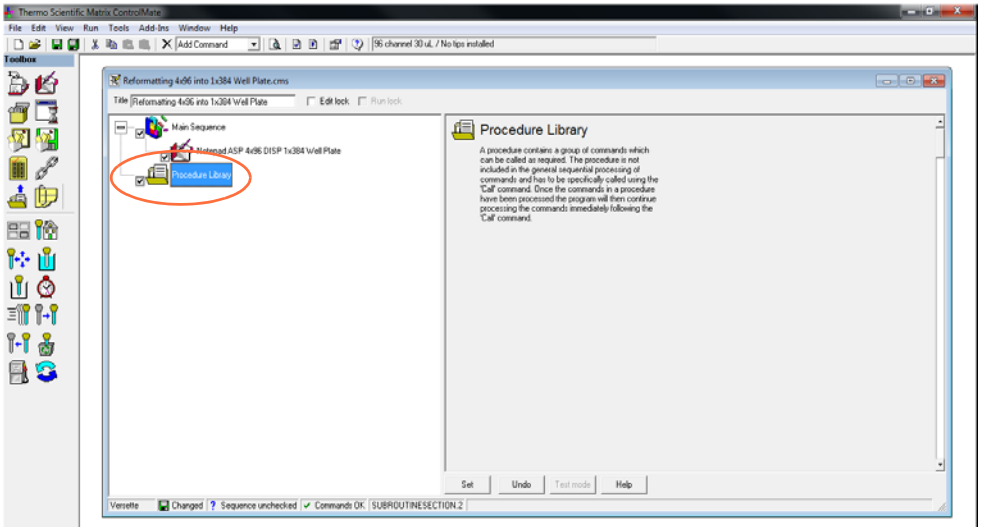
4. Click on the Notepad icon then enter the configuration notes for the stage layout. The example is shown below.



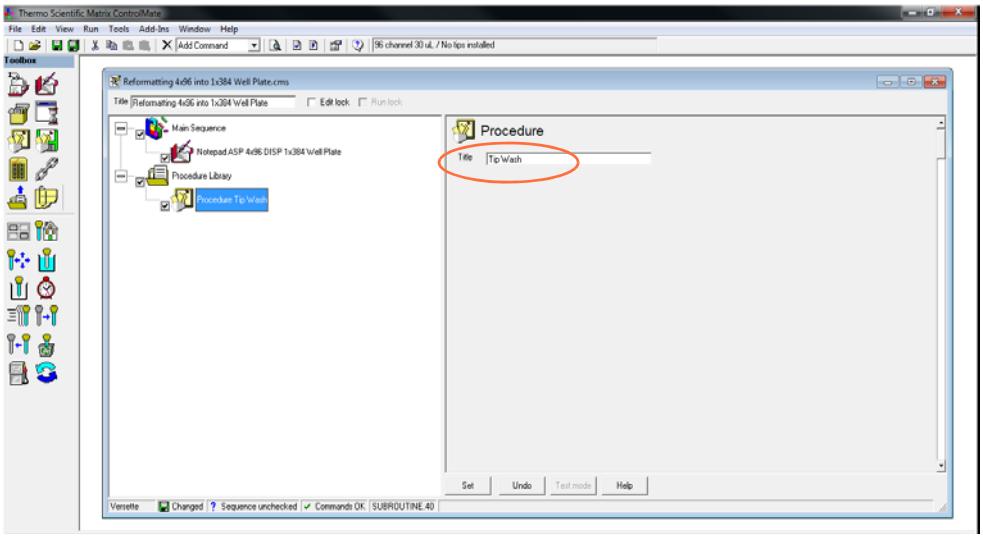
5. Click on the Group  icon then enter a Title for the group, in this example “Aspirate from 4x96 into 1x384 Well Plate”, then enter 1 iterations then select "Set".



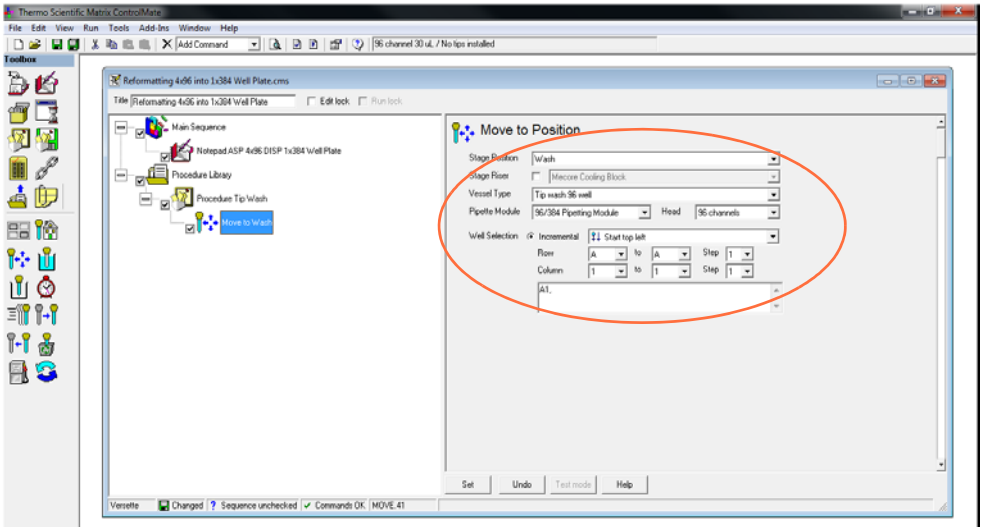
6. Click on the Procedure Library.



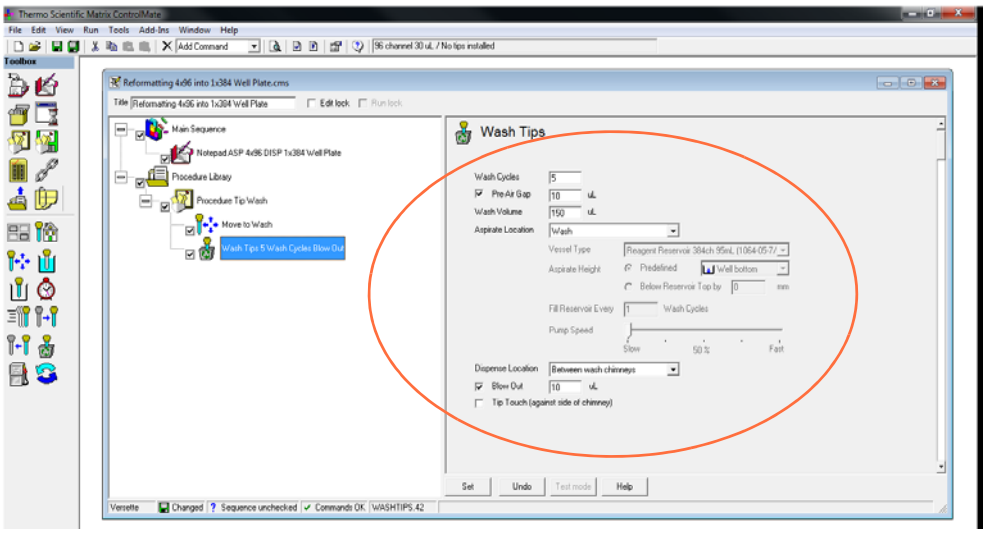
7. Click on the Procedure  icon and enter the title “Tip Wash” as shown then select "Set".



8. Click on the Move  icon, select “Wash” for the Stage Position, fill in the entries as shown, then select "Set".

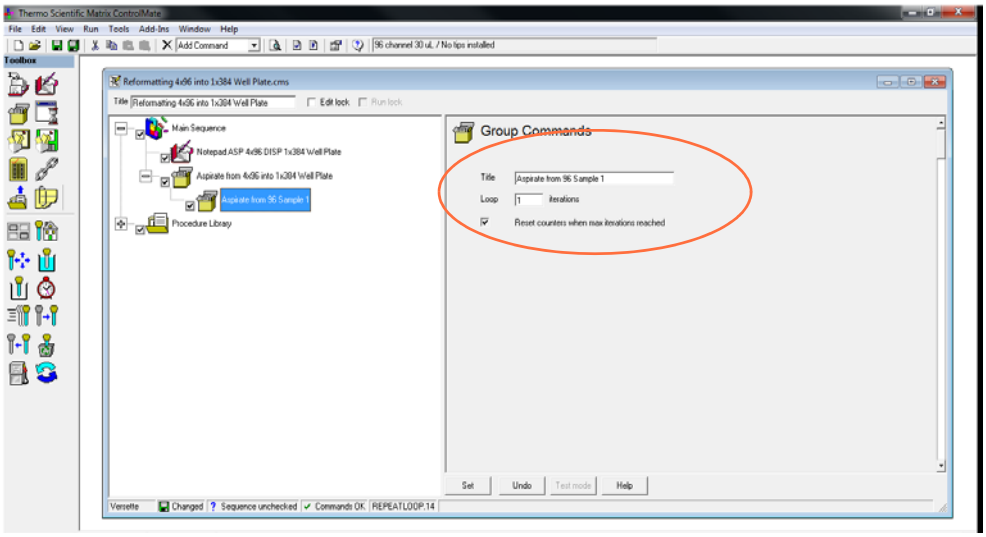


9. Click on the Wash Tips  icon, then enter the following:
   Wash Cycles: 5
   Pre-Air Gap 10 µl
   Wash Volume: 150 µl
   Blow Out: 10 µL,
   then select "Set".

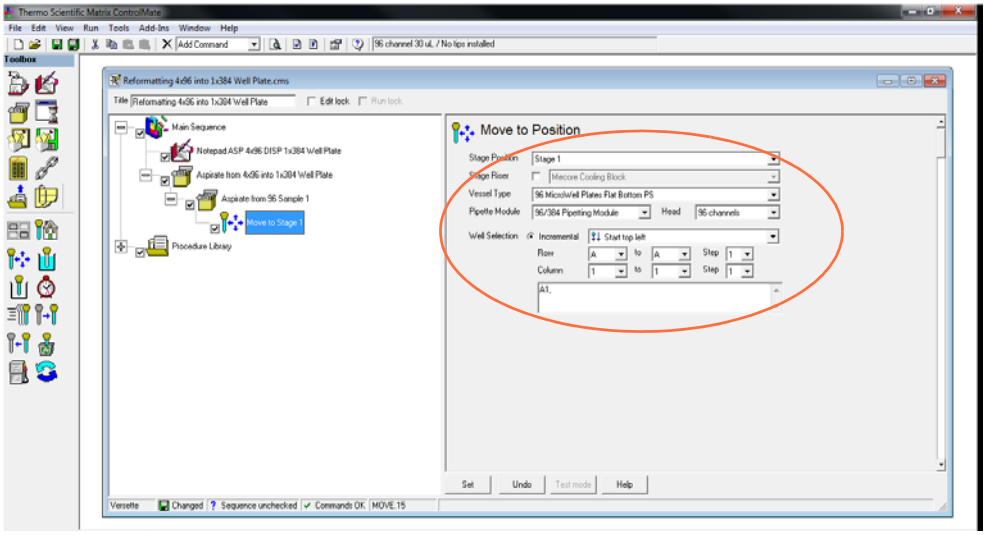


10. Collapse the Procedure Library by clicking on the "-" if desired. The wash procedure will be called repeatedly in the following steps.

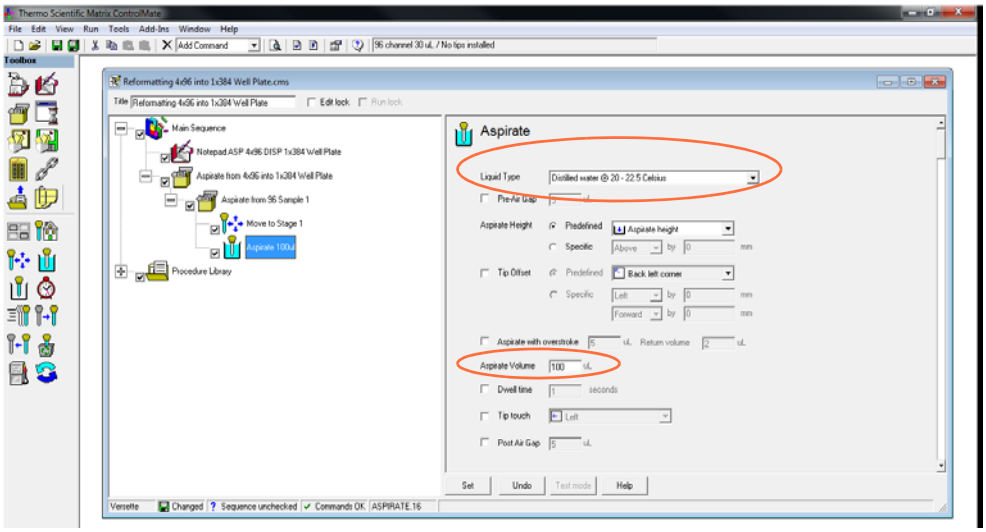
11. Click on the Aspirate from 4x96 into 1x384 Well Plate main Group, then click on the Group  icon, enter the name of the group ("Aspirate from 96 Sample 1"), then select "Set".



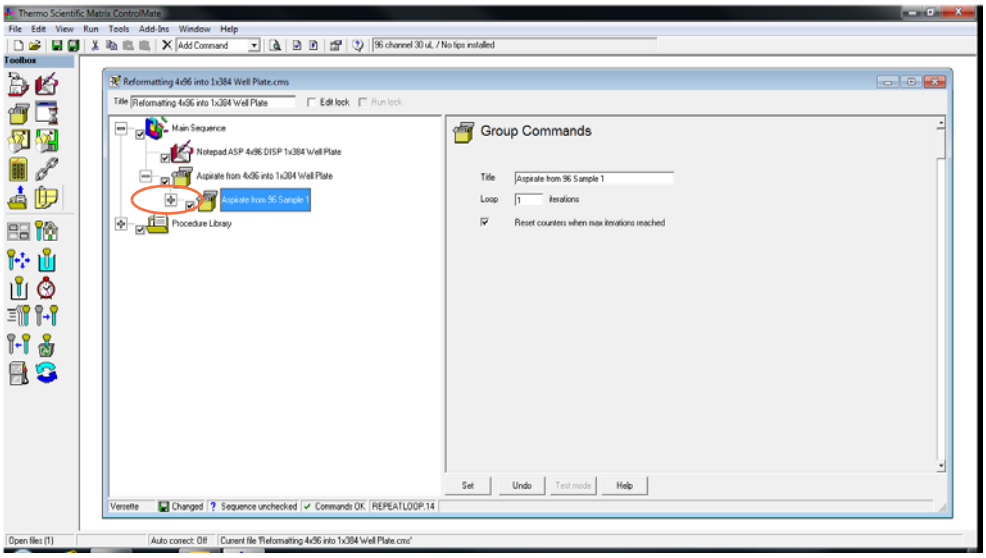
12. Click on the Move  icon, select Stage 1 (see screen), then select "Set".



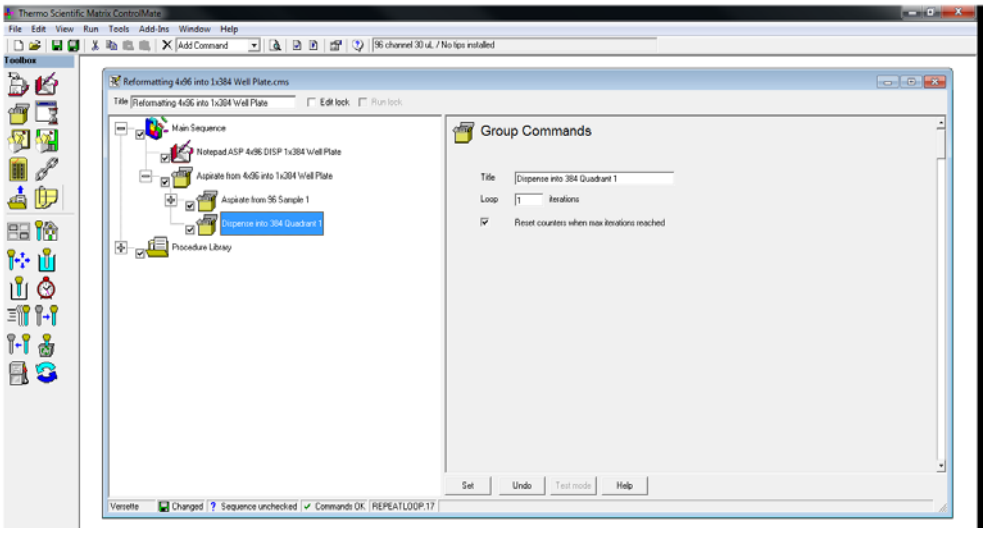
13. Click on the Aspirate  icon, select the Liquid Type and Aspirate Volume as noted, then select "Set".



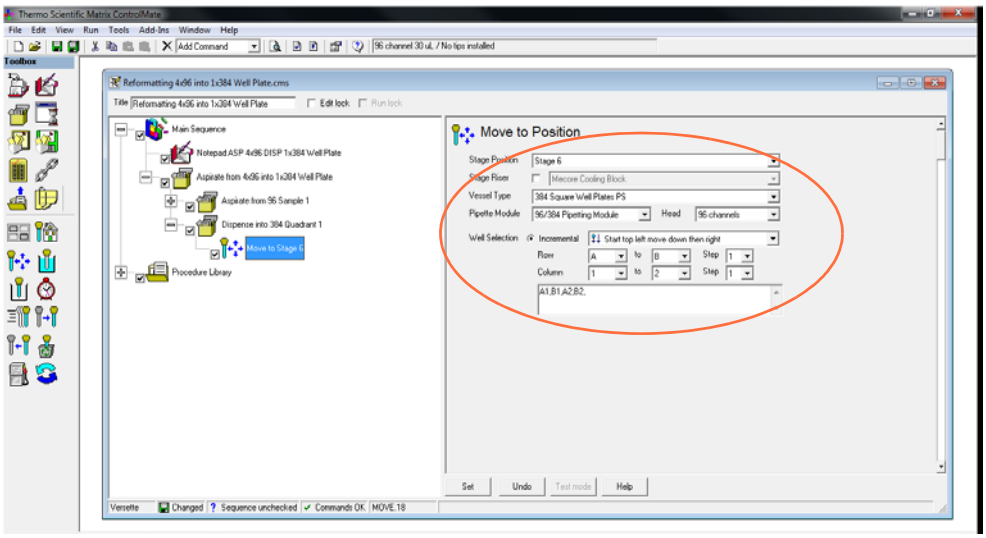
14. Close the Group by clicking on the "-" symbol next to the group.



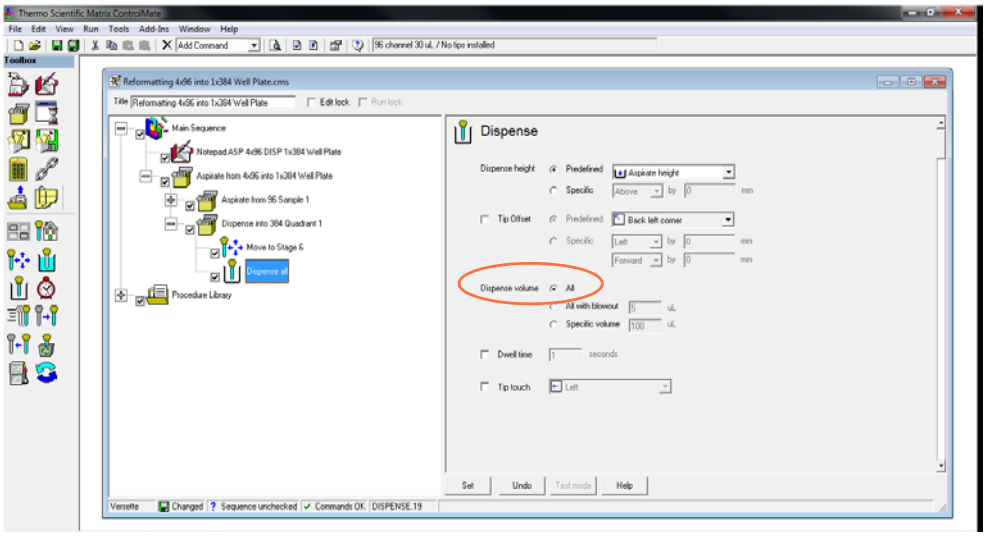
15. Click on the Group  icon, and enter the group title "Dispense into 384 Quadrant 1".



16. Click on the Move  icon, select Stage 6 (see screen) and enter the location as follows:
    Incremental Start top left move down then right
    Row A to Row B
    Column 1 to Column 2,
    then select "Set".

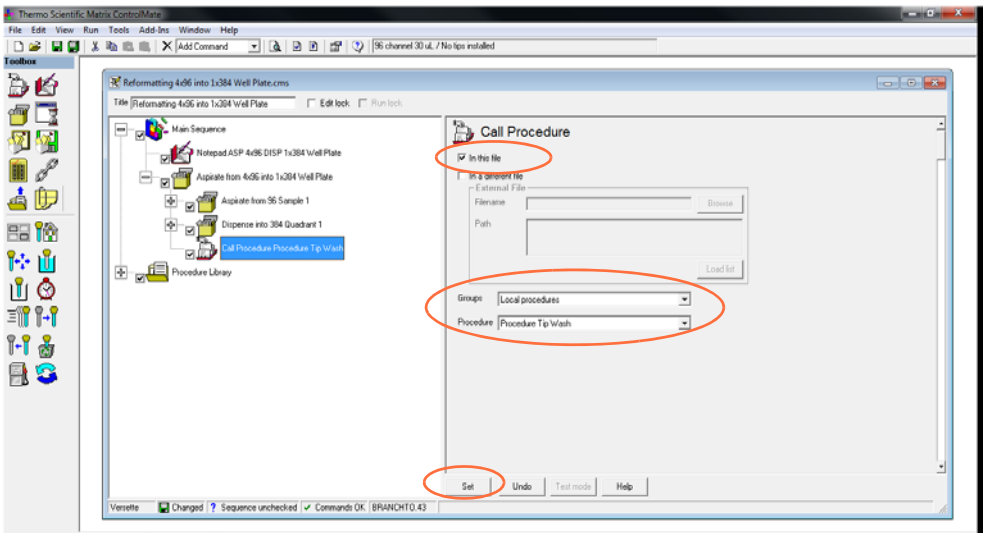


17. Click on the Dispense  icon, select All, then select "Set".

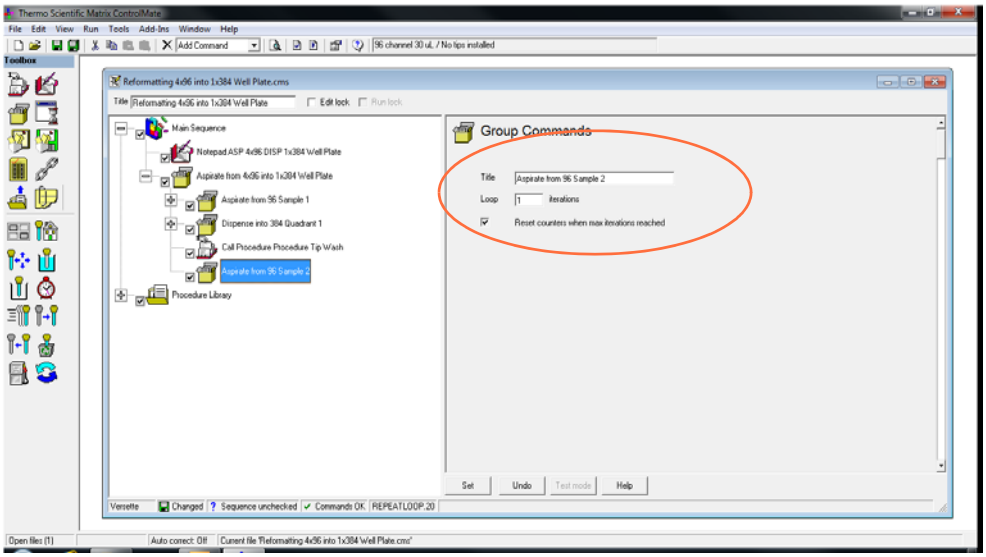


18. Close the group by clicking on the "-" symbol next to the group.

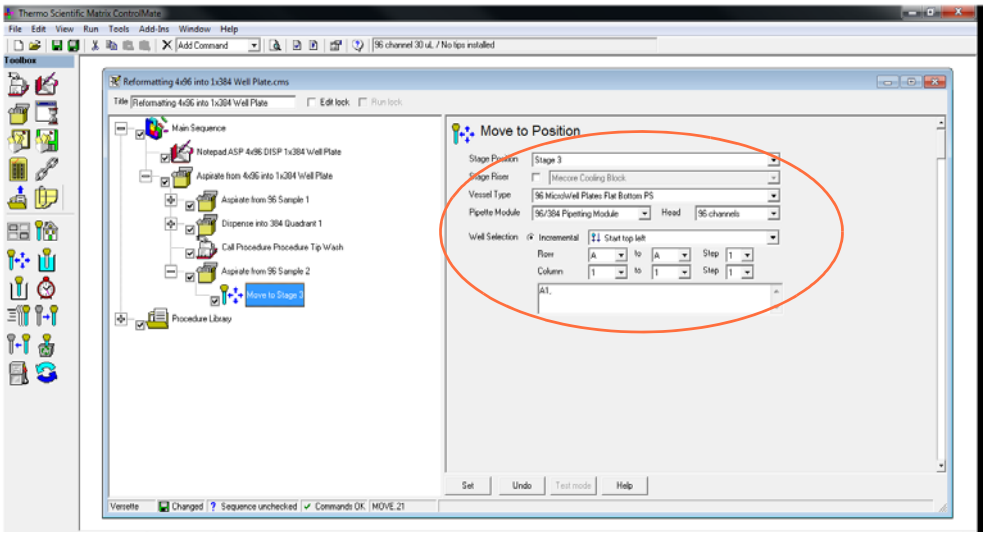
19. Click on the Call Procedure  icon.
Select "In this file" then
Groups: "Local procedures"
Procedure: "Procedure Tip Wash",
then select "Set".



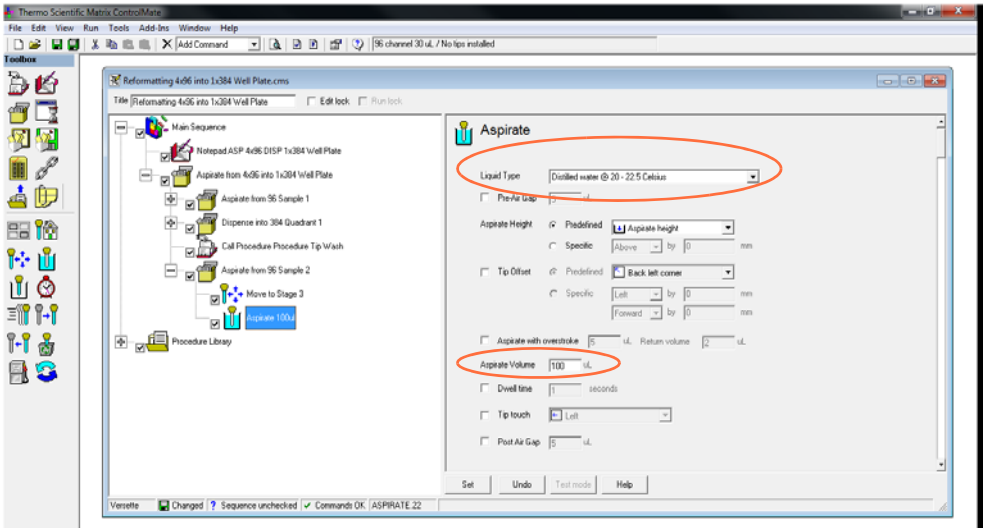
20. Click on the Aspirate from 4x96 into 1x384 Well Plate main Group, then click on the Group  icon, enter the name of the group ("Aspirate from 96 Sample 2"), then select "Set".



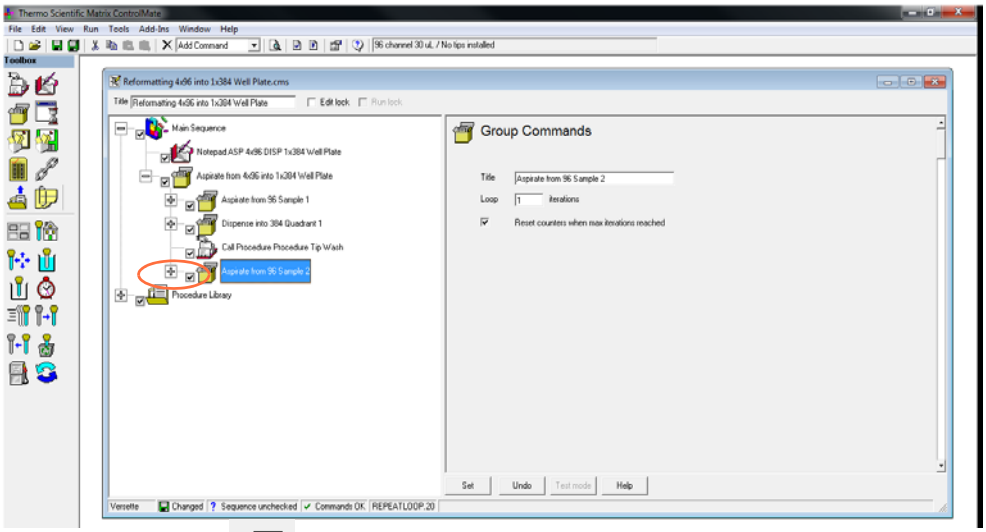
21. Click on the Move  icon, select Stage 3 (see screen), then select "Set".



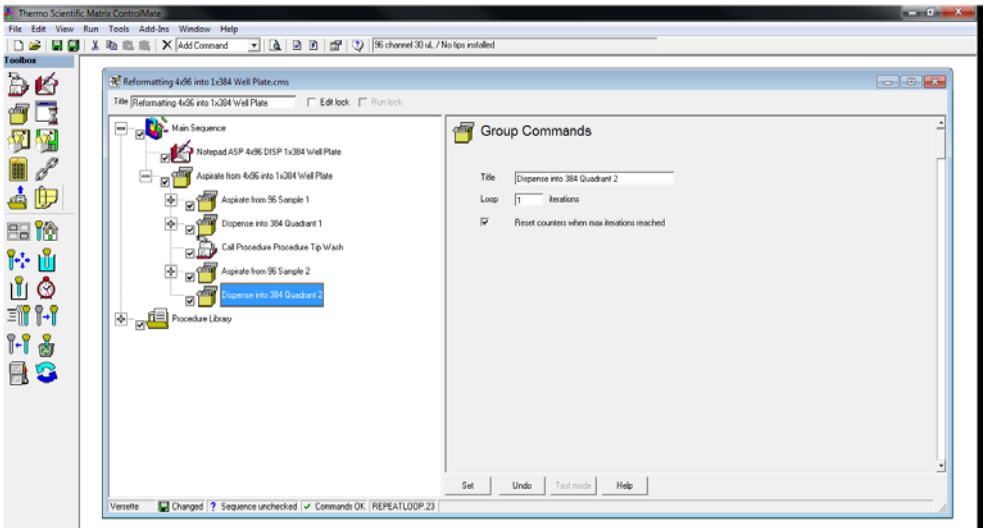
22. Click on the Aspirate  icon, select the Liquid Type and Aspirate Volume as noted, then select "Set".



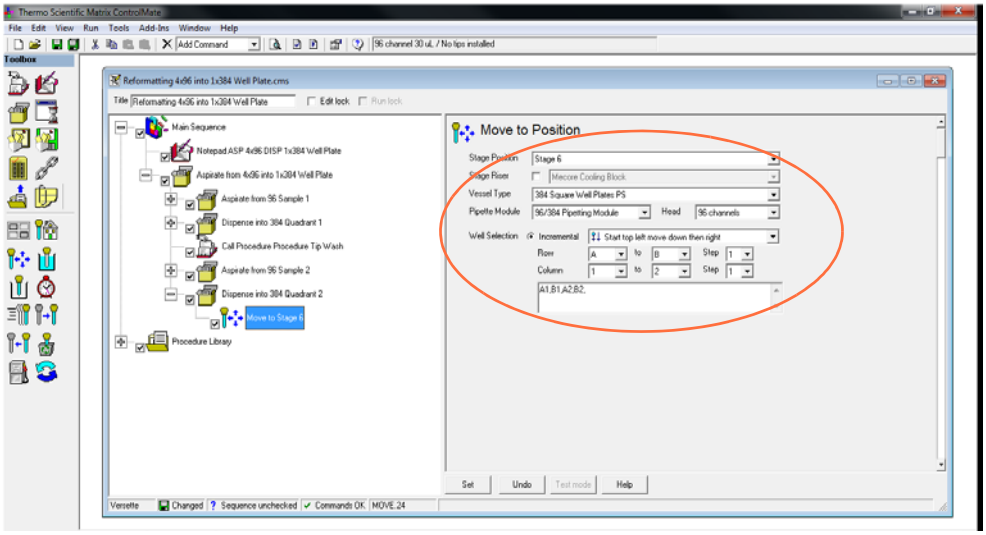
23. Close the Group by clicking on the "-" symbol next to the group.



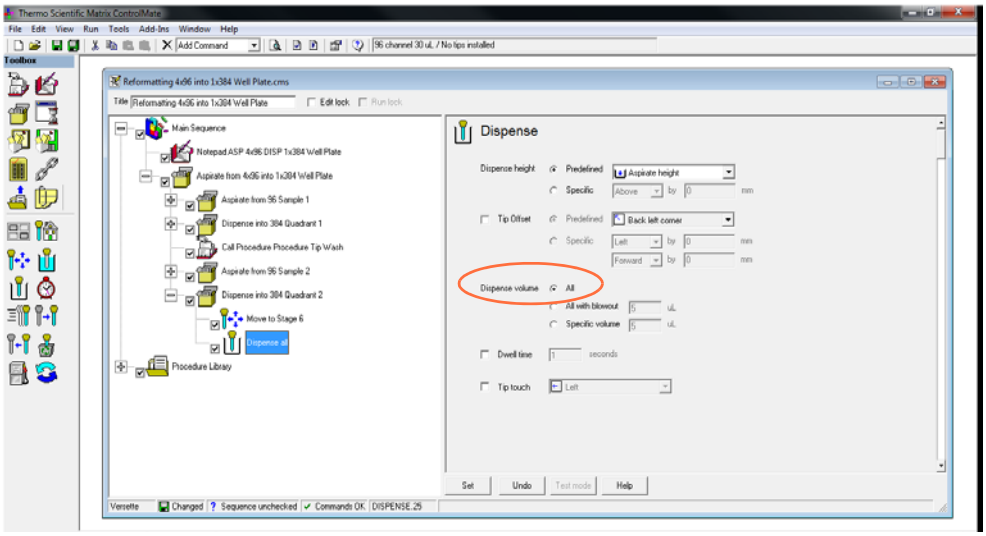
24. Click on the Group  icon, and enter the group title "Dispense into 384 Quadrant 2".



25. Click on the Move  icon, select Stage 6 (see screen) and enter the location as follows:
Incremental Start top left move down then right
Row A to Row B
Column 1 to Column 2,
then select "Set".

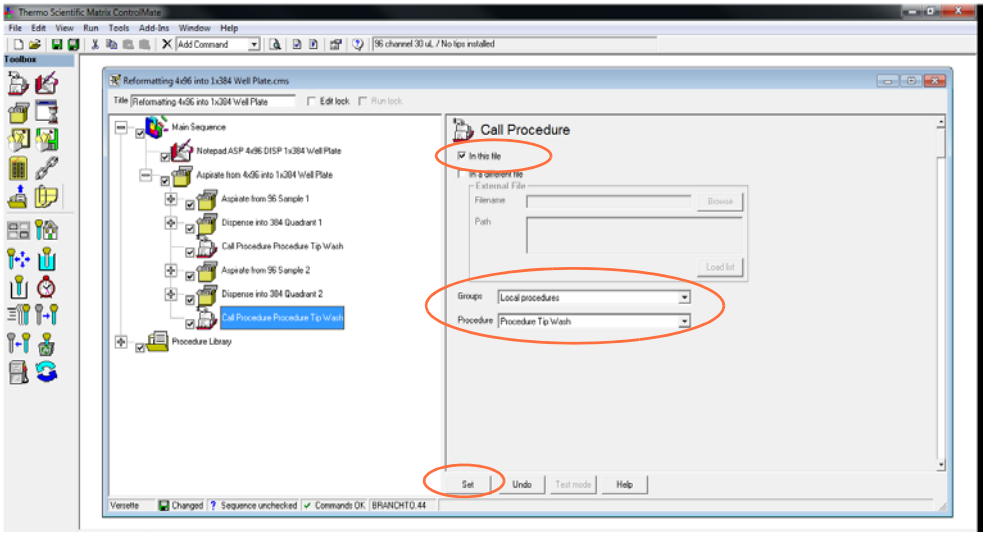


26. Click on the Dispense  icon, select All, then select "Set".

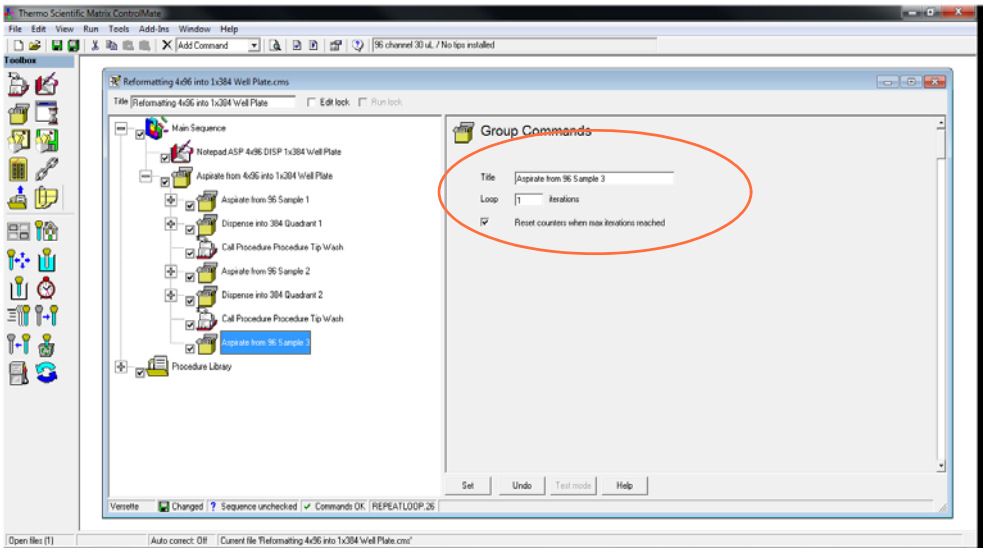


27. Close the group by clicking on the "-" symbol next to the group.

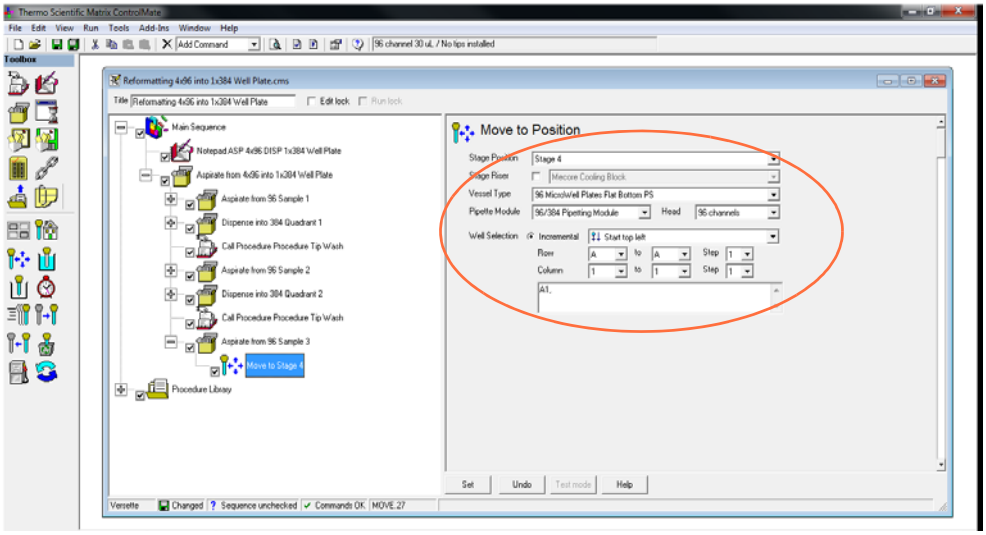
28. Click on the Call Procedure  icon.
Select "In this file" then
Groups: "Local procedures"
Procedure: "Procedure Tip Wash",
then select "Set".



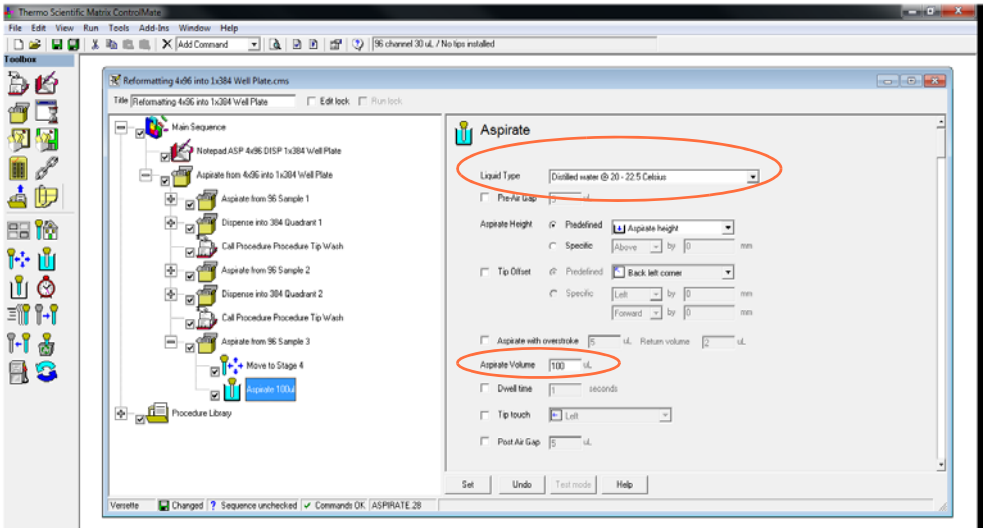
29. Click on the Aspirate from 4x96 into 1x384 Well Plate main Group, then click on the Group  icon, enter the name of the group ("Aspirate from 96 Sample 3"), then select "Set".



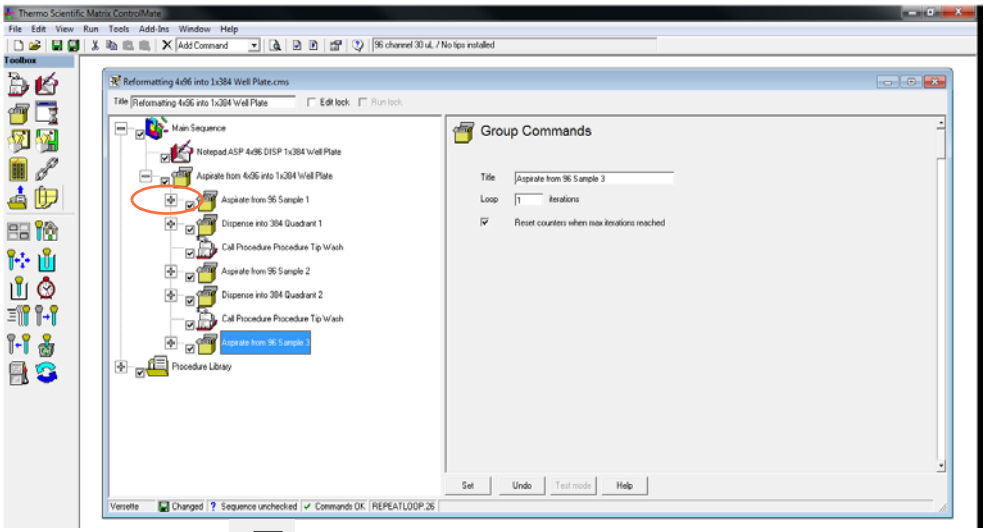
30. Click on the Move  icon, select Stage 4 (see screen), then select "Set".



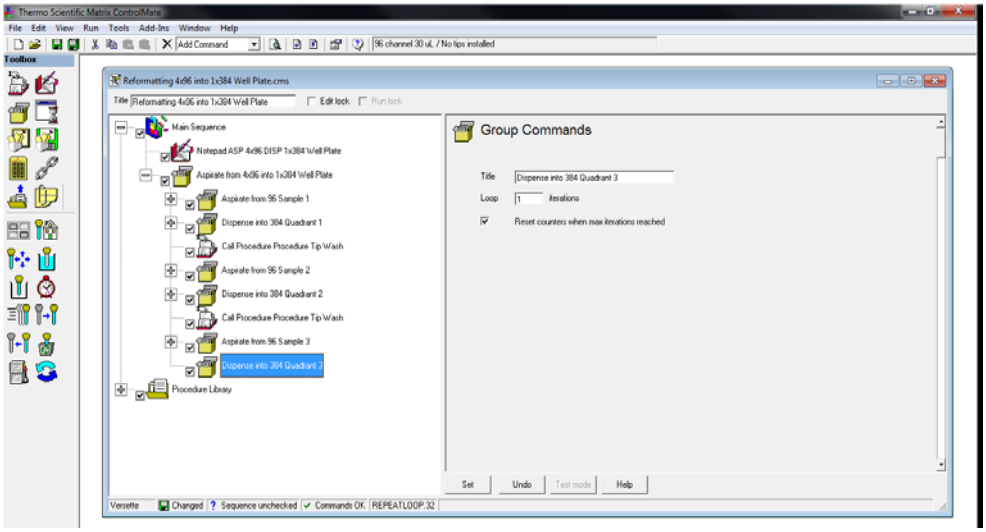
31. Click on the Aspirate  icon, select the Liquid Type and Aspirate Volume as noted, then select "Set".



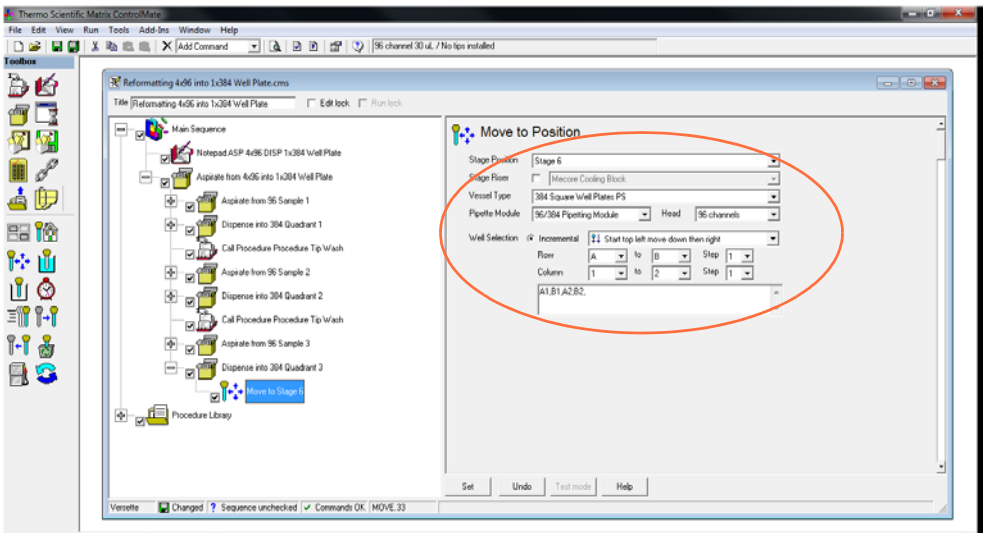
32. Close the Group by clicking on the "-" symbol next to the group.



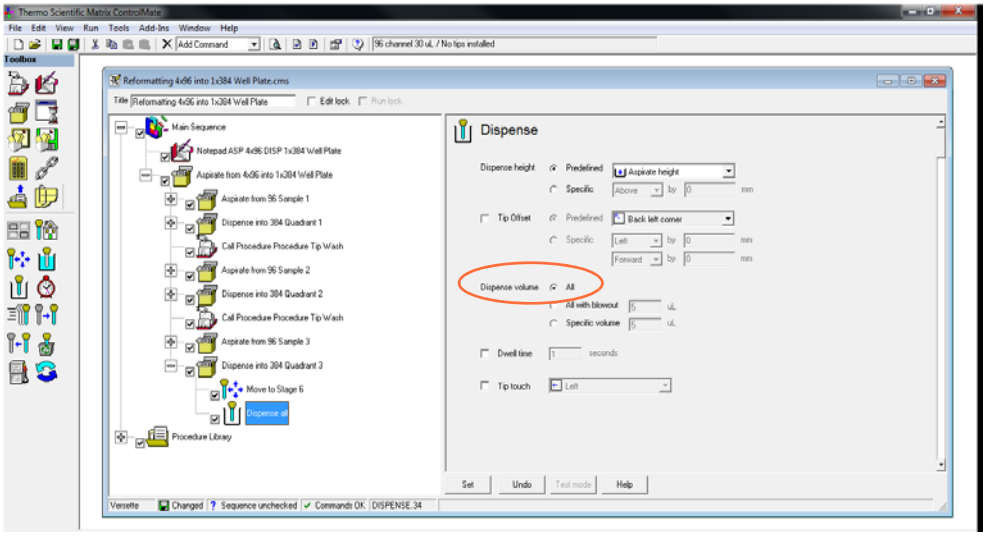
33. Click on the Group  icon, and enter the group title "Dispense into 384 Quadrant 3".



34. Click on the Move  icon, select Stage 6 (see screen) and enter the location as follows:
Incremental Start top left move down then right
Row A to Row B
Column 1 to Column 2,
then select "Set".

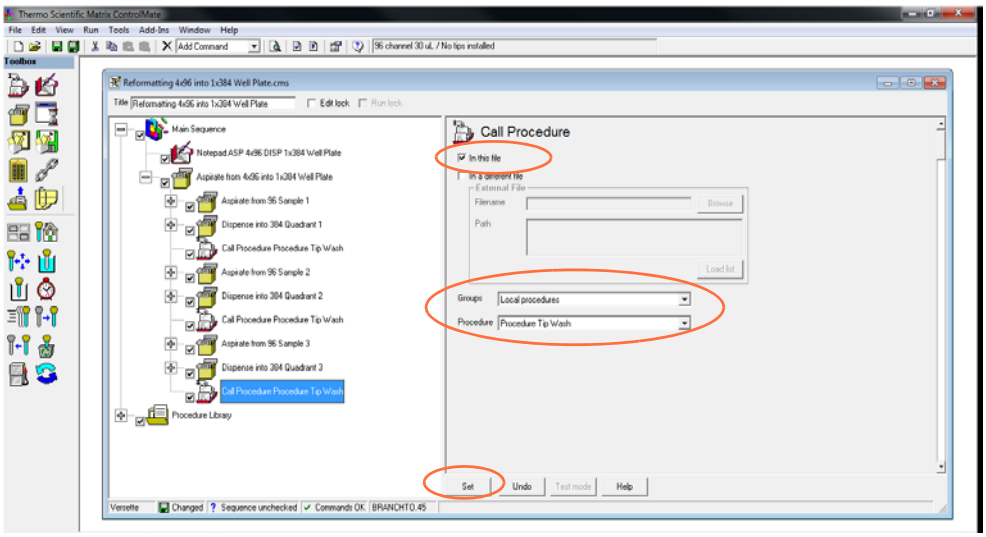


35. Click on the Dispense  icon, select All, then select "Set".

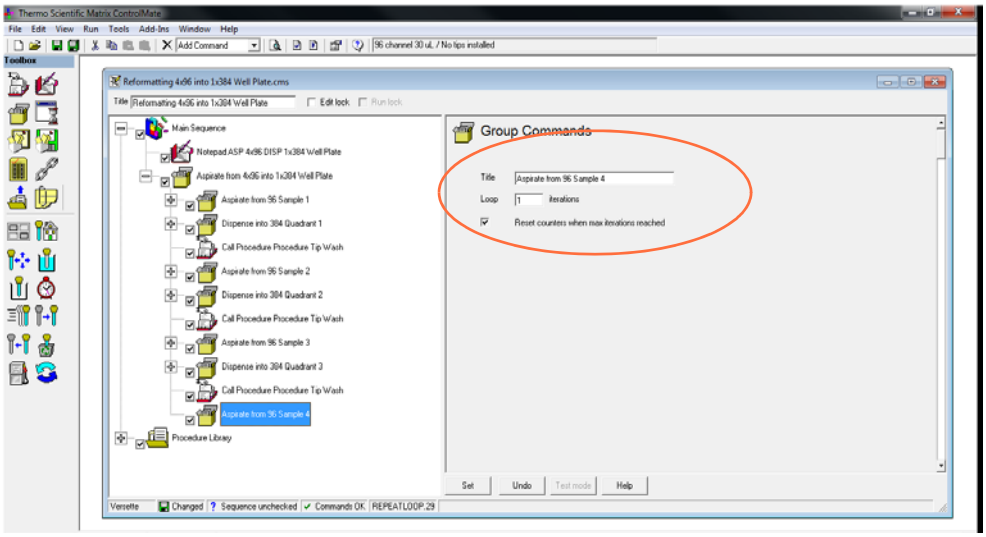


36. Close the group by clicking on the "-" symbol next to the group.

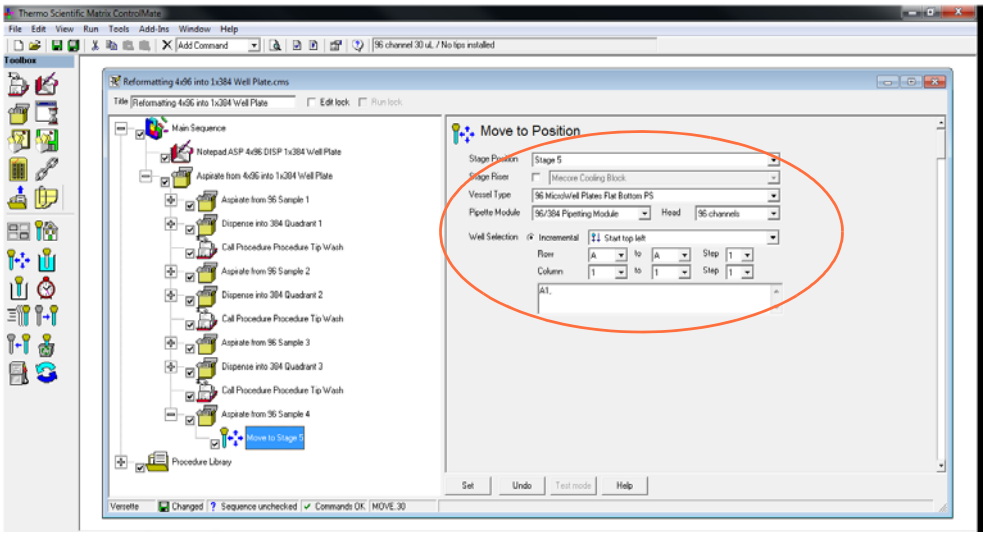
37. Click on the Call Procedure  icon.
Select "In this file" then
Groups: "Local procedures"
Procedure: "Procedure Tip Wash",
then select "Set".



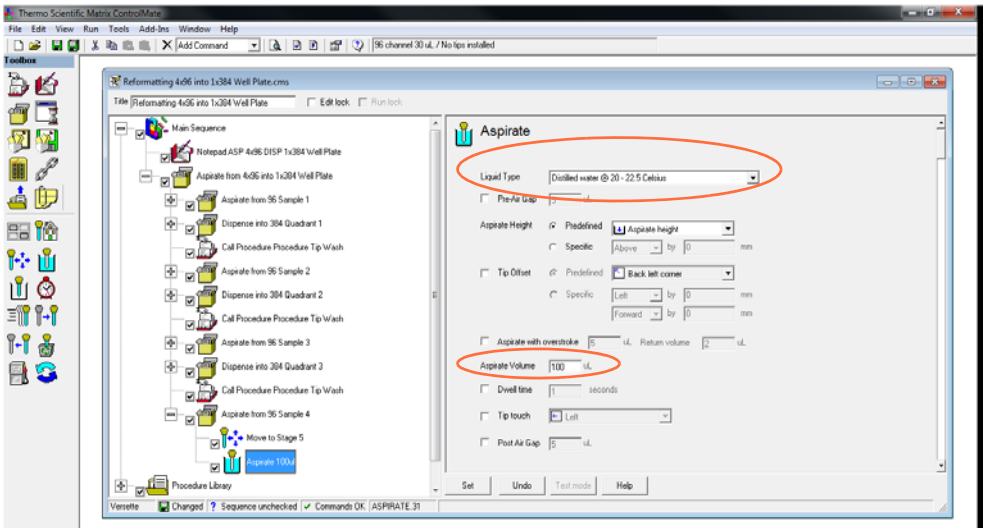
38. Click on the Aspirate from 4x96 into 1x384 Well Plate main Group, then click on the Group  icon, enter the name of the group ("Aspirate from 96 Sample 4"), then select "Set".



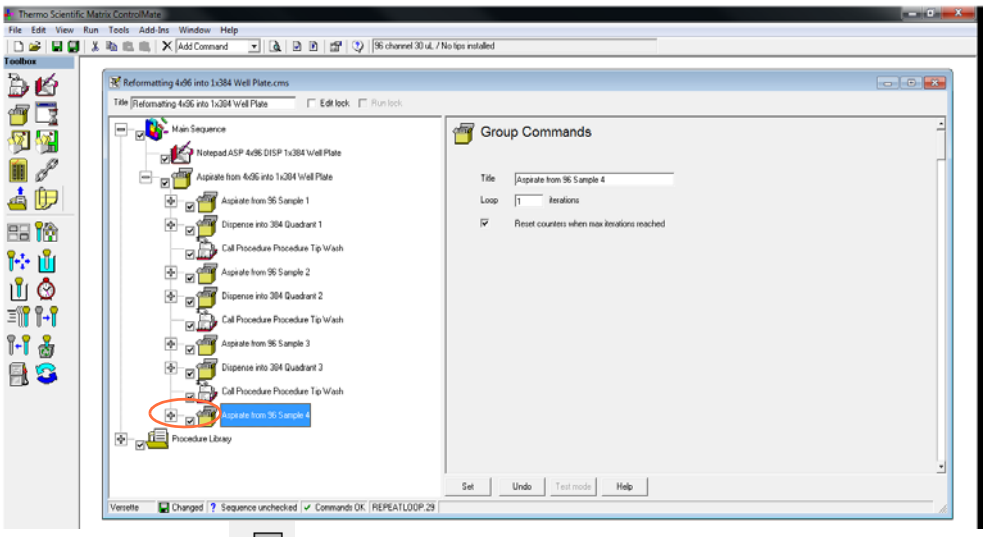
39. Click on the Move  icon, select Stage 5 (see screen), then select "Set".



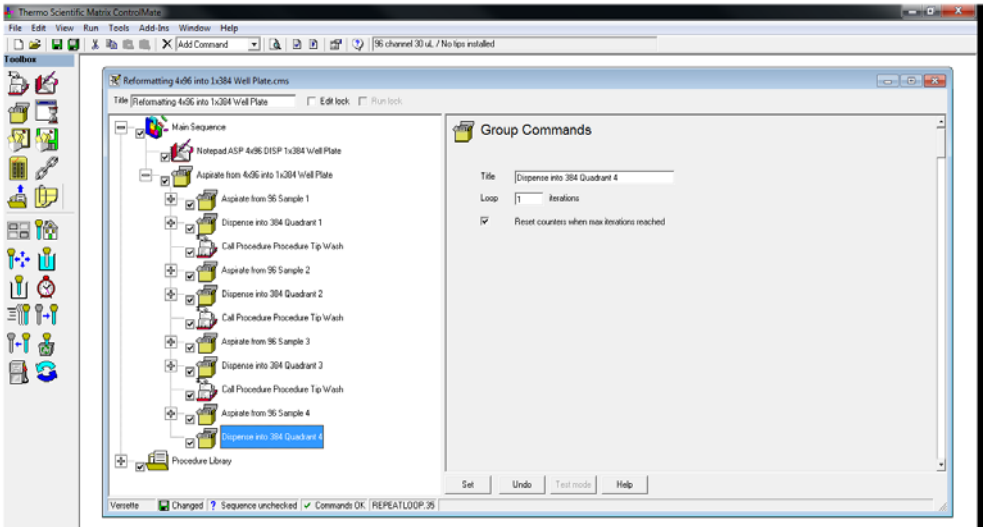
40. Click on the Aspirate  icon, select the Liquid Type and Aspirate Volume as noted, then select "Set".



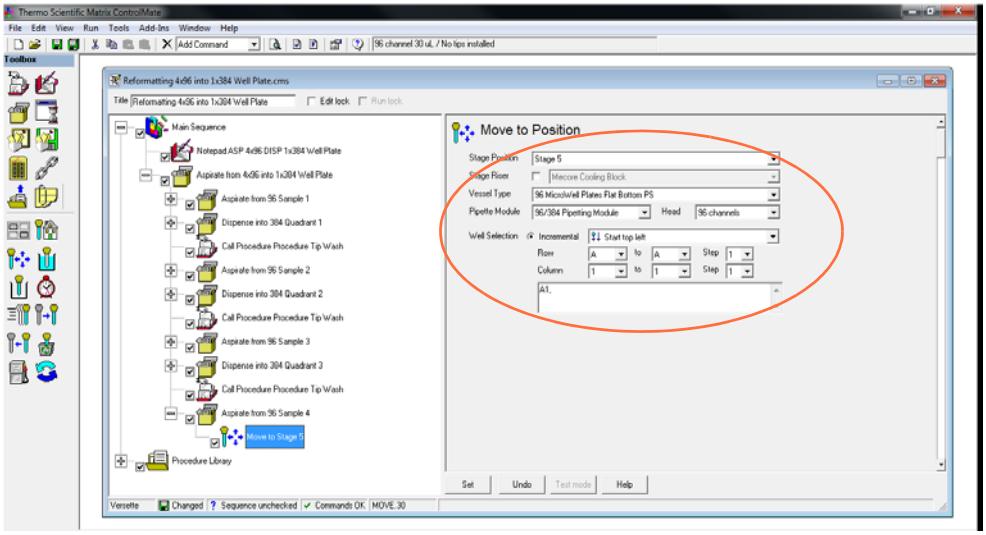
41. Close the Group by clicking on the "-" symbol next to the group.



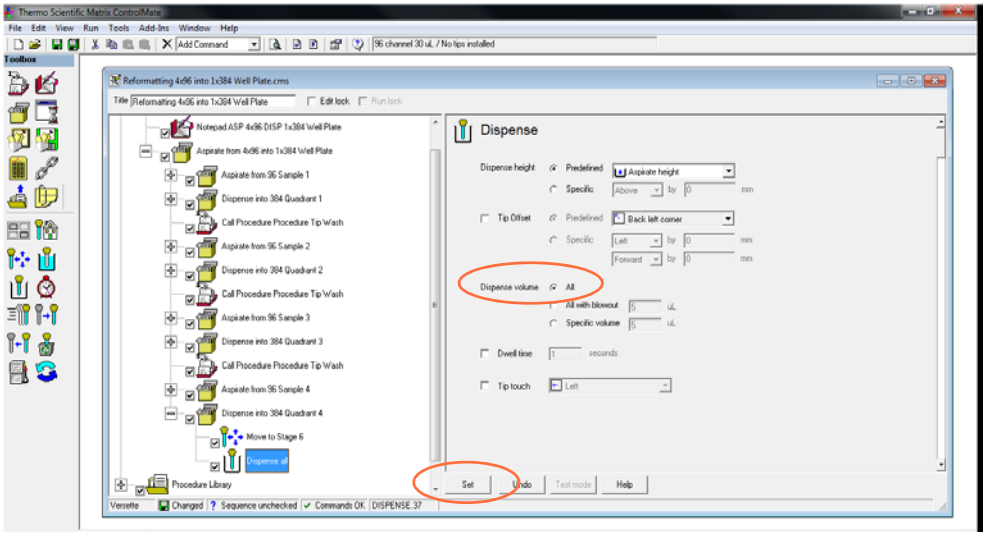
42. Click on the Group  icon, and enter the group title "Dispense into 384 Quadrant 4".



43. Click on the Move  icon, select Stage 6 (see screen) and enter the location as follows:
Incremental Start top left move down then right
Row A to Row B
Column 1 to Column 2,
then select "Set".

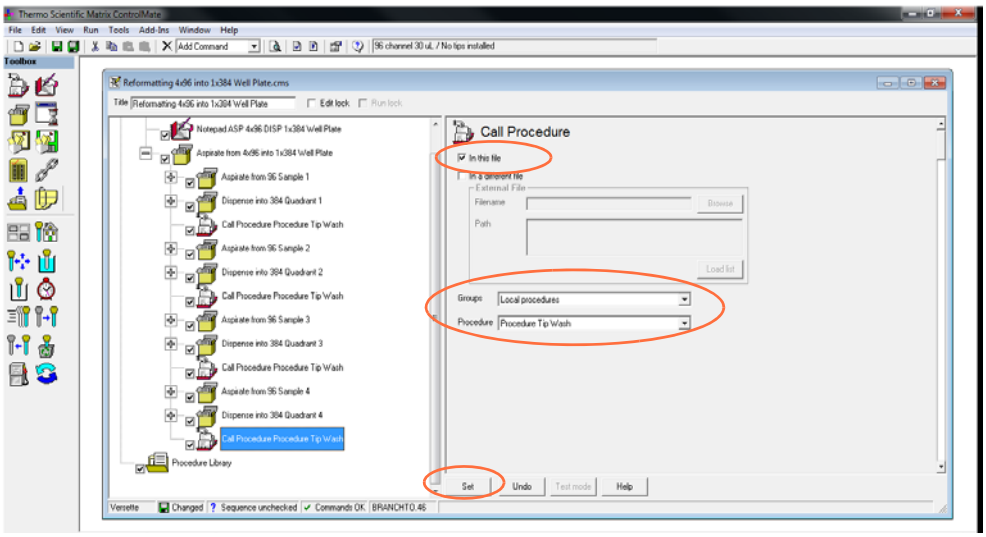


44. Click on the Dispense  icon, select All, then select "Set".



45. Close the group by clicking on the "-" symbol next to the group.

46. Click on the Call Procedure  icon.
Select "In this file" then
Groups: "Local procedures"
Procedure: "Procedure Tip Wash",
then select "Set".



Example Sequence 5: Plate Reformatting with Global Variable

The following example walks through the creation of a simple plate reformatting sequence. In this sequence, a 96 channel head aspirates fluid starting from Stage 3, moves to Stage 1, and dispenses the fluid into Quadrant 1. The process then repeats three more times: aspirating fluid next from Stage 4, then Stage 5, and then Stage 6, and dispensing fluid into Quadrant 2, Quadrant 3, then Quadrant 4 of the 384 well plate on Stage 1.

A Tip Wash Station will be placed on Stage 2. The sequence consists of aspirating fluid from each source and dispensing that fluid onto the appropriate quadrants in the destination plate, and completing a tip wash cycle between each fluid transfer, to ensure the tips are clean and do not cross-contaminate the fluids in each of the four source plates

Between each dispense, a Call Procedure is used to wash the tips. This is done to show the use of the Call procedure. A Global Variable is used in this simplistic example to display the current status of the aspirate/dispense sequence.

Example Sequence 5: Overview

Sequence is as follows:

Assign a Global Value called “PLATE_INCREMENT”. This ‘text’ label begins at “PLATE INCREMENT” and each time the sequence returns to Stage 3, the Global Value increments by 1, as follows:

a. Aspirate from Stage 3, move to Stage 3. set Global Variable to: PLATE_INCREMENT 1, Move to Stage 1 then Dispense all.

b. Aspirate from Stage 3, move to Stage 3. set Global Variable to: PLATE_INCREMENT 2, Move to Stage 1 then Dispense all.

c. Aspirate from Stage 3, move to Stage 3. set Global Variable to: PLATE_INCREMENT 3, Move to Stage 1 then Dispense all.

d. Aspirate from Stage 3, move to Stage 3. set Global Variable to: PLATE_INCREMENT 4, Move to Stage 1 then Dispense all.

The Call Procedure Command is used between each dispense operation to call a tip washing procedure from the Procedure Library. Rather than re-writing the move and wash sequence, for each of the four dispense cycles, the procedure is written just once (Move to the wash station on Stage 2, then Wash Tips 5 Wash Cycles with Blow Out).

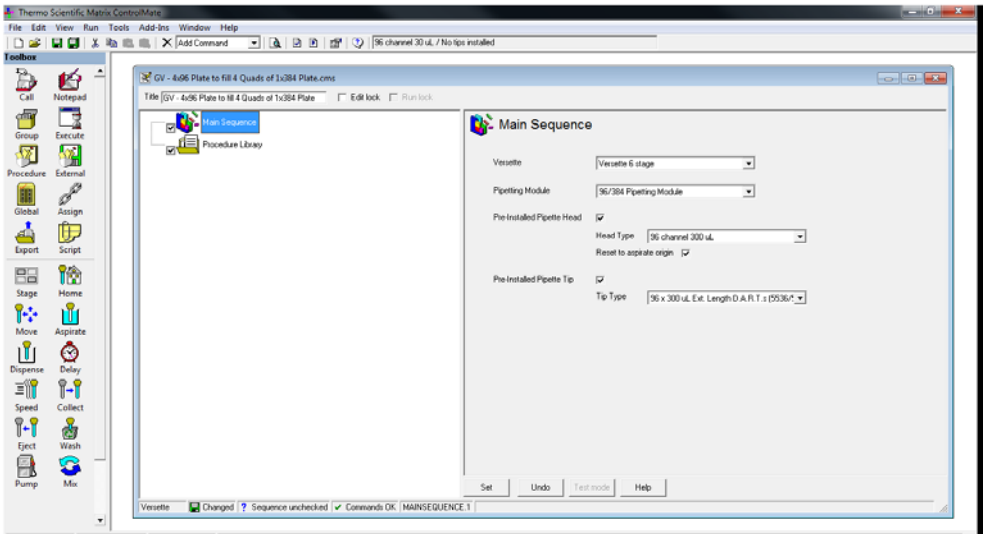
Refer to the previous examples and sections of this manual for details on command and screen options which are summarized on the following pages for this reformatting sequence.

Example Sequence 5: Plate Reformatting with Global Variable Program Creation

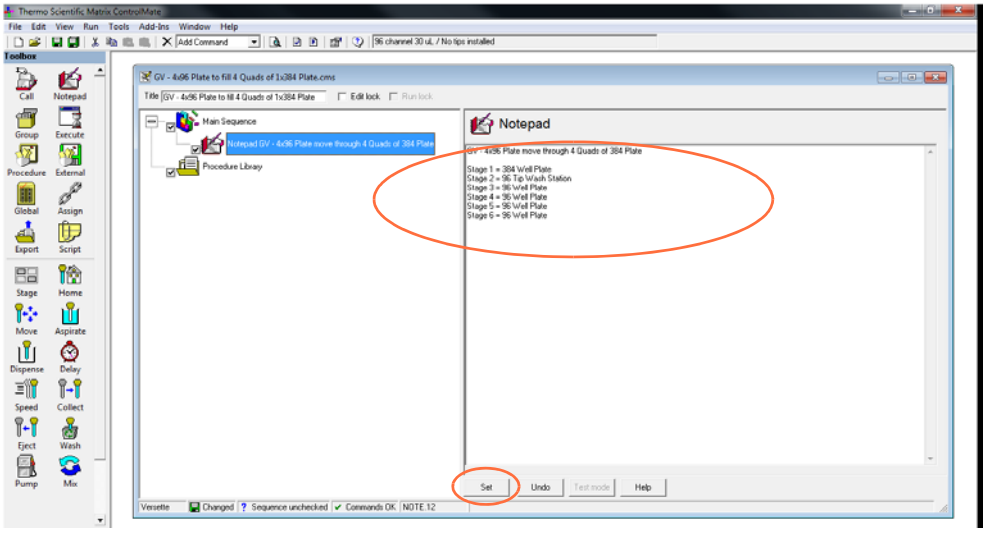
1. Verify that communication is properly set with the ***Versette*** system, and that the configuration has been properly set. Refer to the "*Configuring ControlMate*" section of this manual for details.

2. Under the Main Sequence command, verify the correct head and tips are selected as appropriate. This sequence assumes that pipette tips are already loaded into the system.

3. Select "**New Sequence File**" from the File menu or click the new sequence button on the main menu.



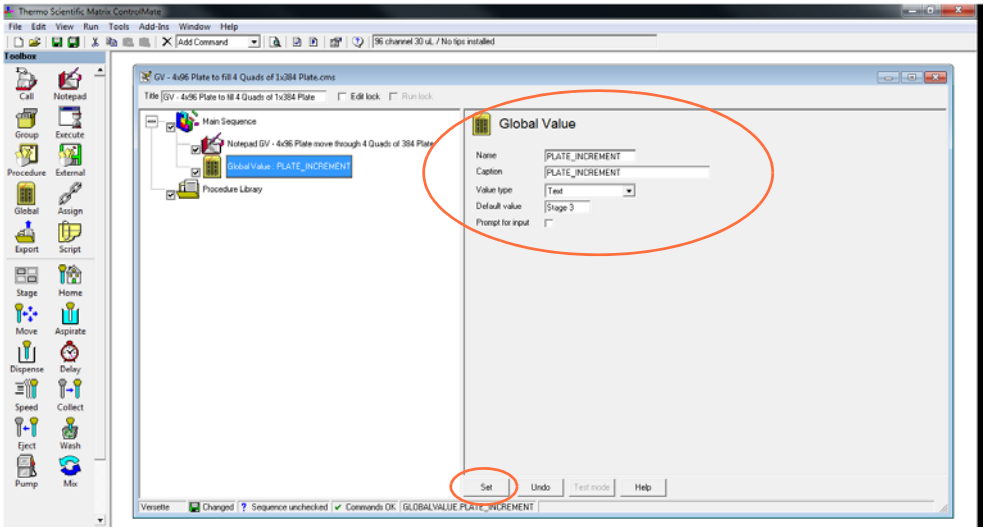
4. Click on the Notepad icon then enter the configuration notes for the stage layout. The example is shown below.



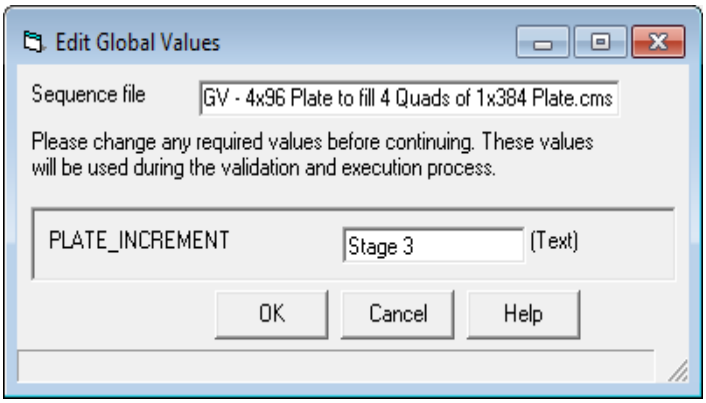
5. Click on the Global Value  icon then enter a name “PLATE INCREMENT” and other entries as shown below.

Note! If the user wants the ability to change the original stage location where the 96 well plate is positioned to have sample aspirated from to start, the “Prompt for input” check box should be selected. Other wise it will always aspirate from the default location, selected in this example as Stage Position 3.

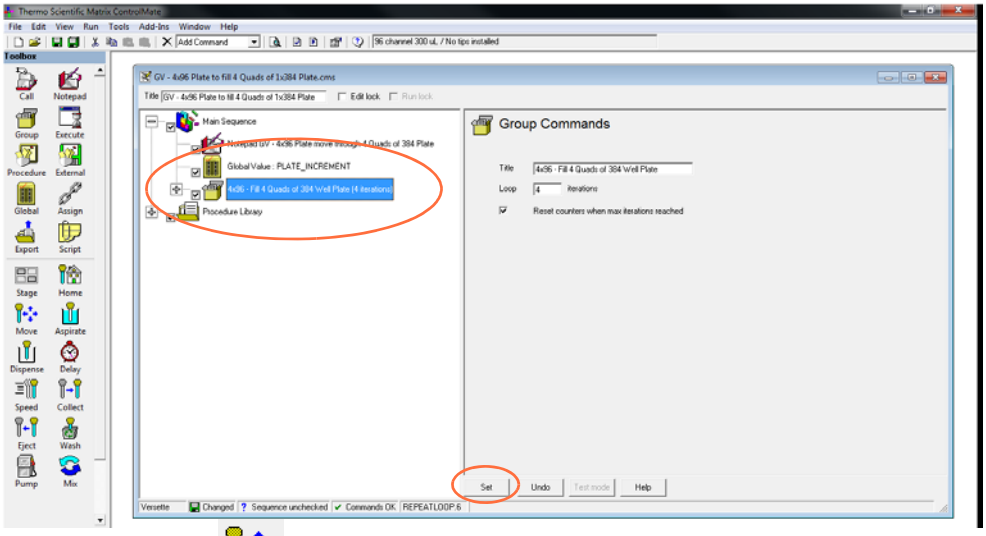
It should go in order of the numbered stages: 1, 2, 3, 4, 5, 6 or in this case with 4 iterations and starting at stage 3: 3, 4, 5, 6



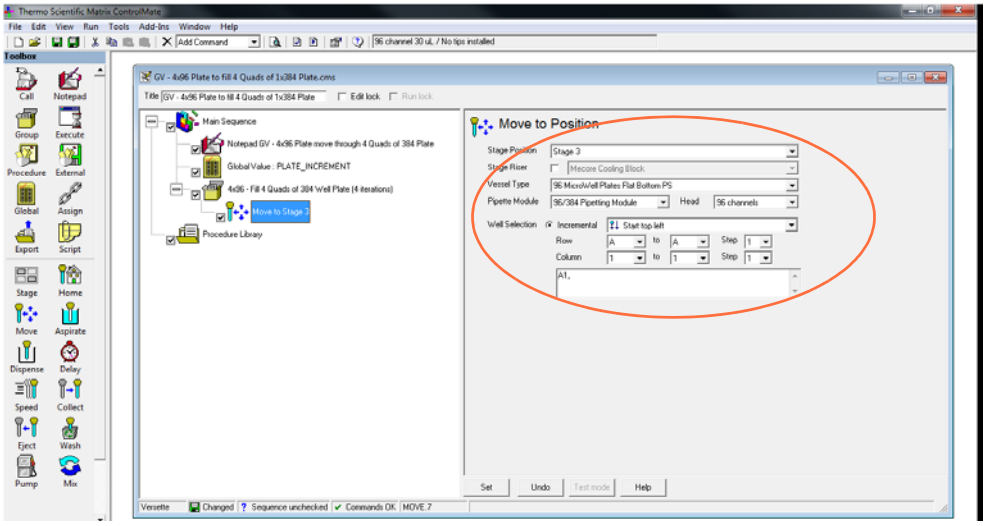
Note! If desired, you can select the “Prompt for input” checkbox to display a prompt to the user at run-time. In this example, if the “Prompt for input” is selected (checked), when the protocol is run, the following prompt will be displayed to allow the user to enter a new value for the “PLATE_INCREMENT” global variable.



6. Click on the Group  icon then enter a Title for the group, in this example “4x96 - Fill 4 Quads of 384 Well Plate (4 iterations)”, then enter 4 iterations then select "Set".

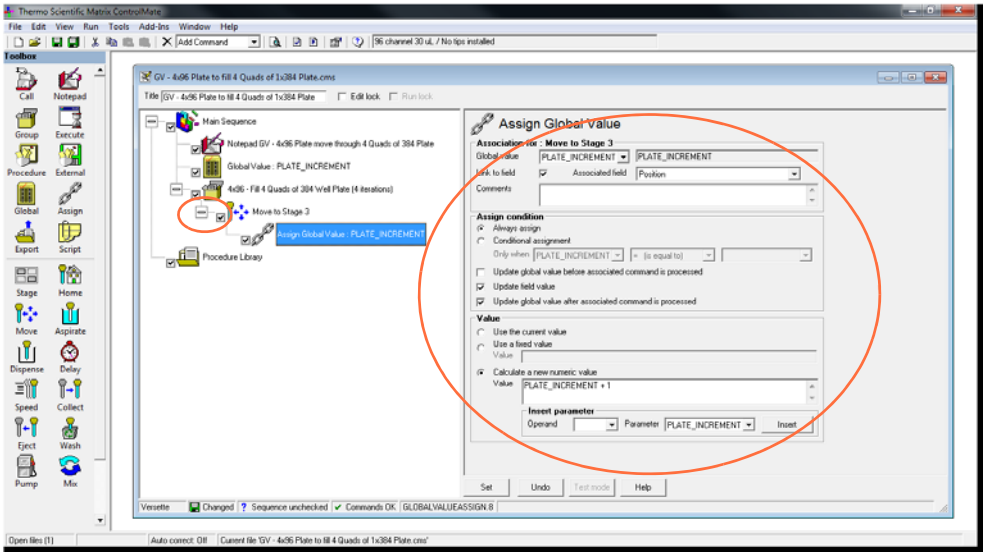


7. Click on the Move  icon, select Stage 3 (see screen), enter variables as shown, then select "Set".



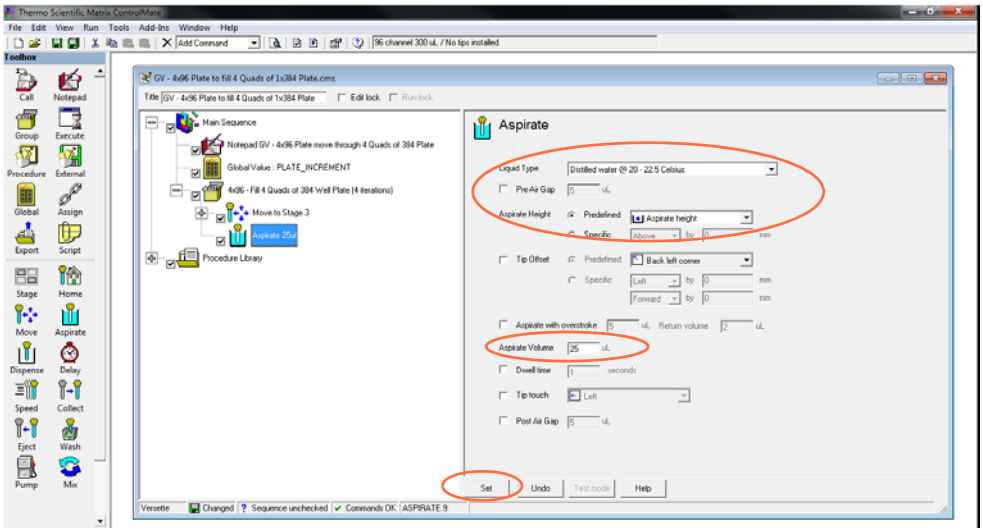
8. Click on the Assign Global Value  icon, enter variables as shown, then select "Set".

Note! The “PLATE _INCREMENT + 1 will add 1 to the PLATE_INCREMENT global variable count as it moves to the next stage position in the sequence each time the protocol runs through this step.

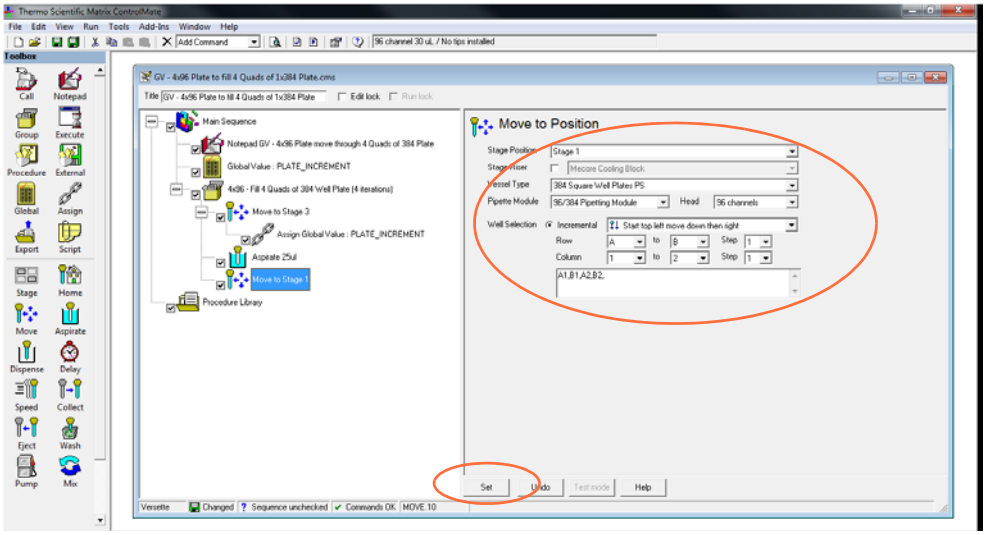


9. Click on “-” symbol next to the Move command to collapse the step.

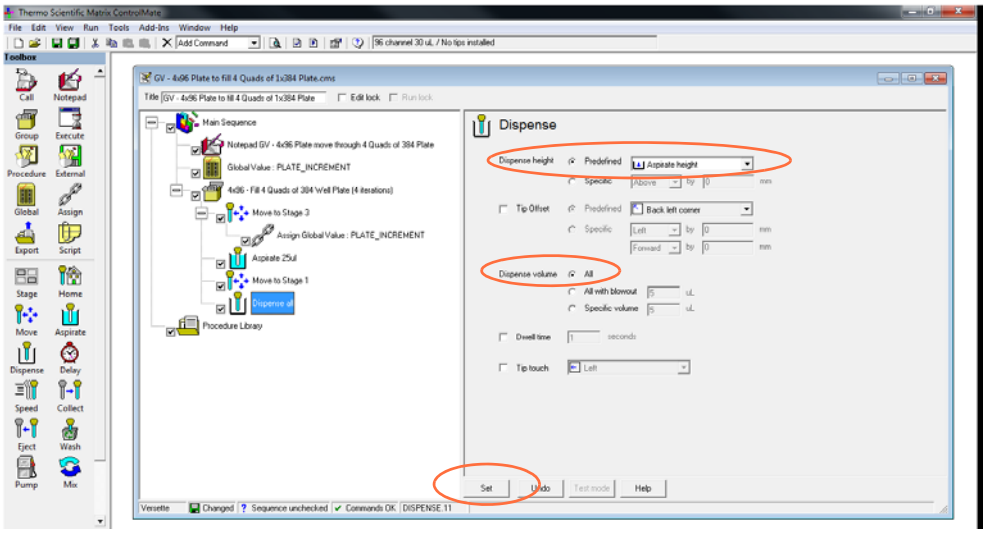
10. Click the Aspirate  icon, select the Liquid Type, Aspirate Height, and Aspirate Volume as shown, then select "Set".



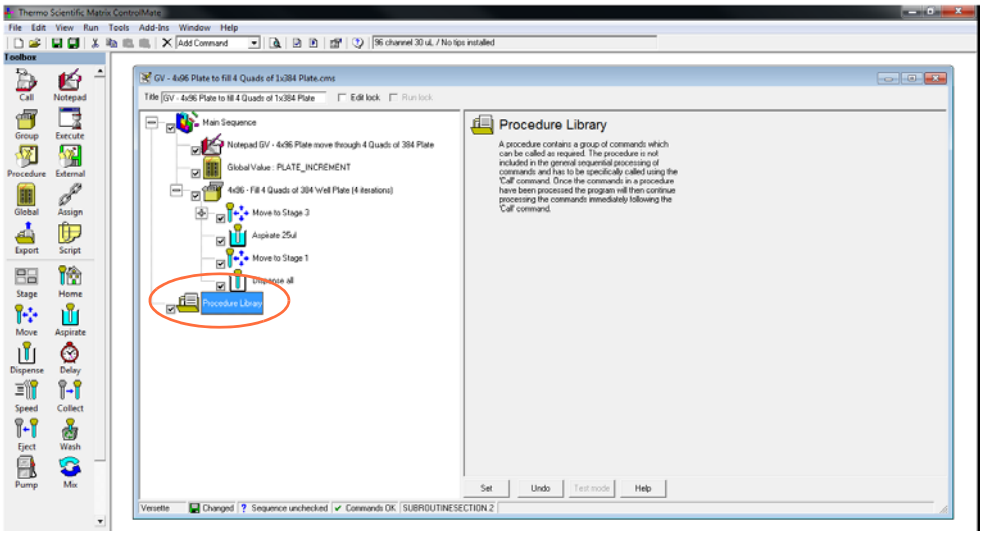
11. Click on the Move  icon, select Stage 1 (see screen) and enter the location as follows:
Incremental Start top left move down then right
Row A to Row B
Column 1 to Column 2,
then select "Set".



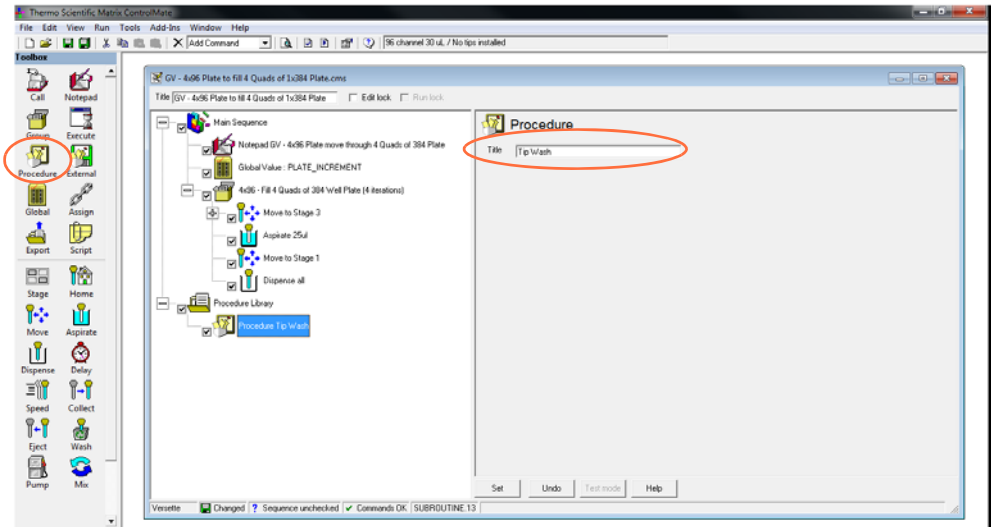
12. Click on the Dispense  icon, select the Dispense Height, for the Dispense Volume select “All”, then select “Set”.



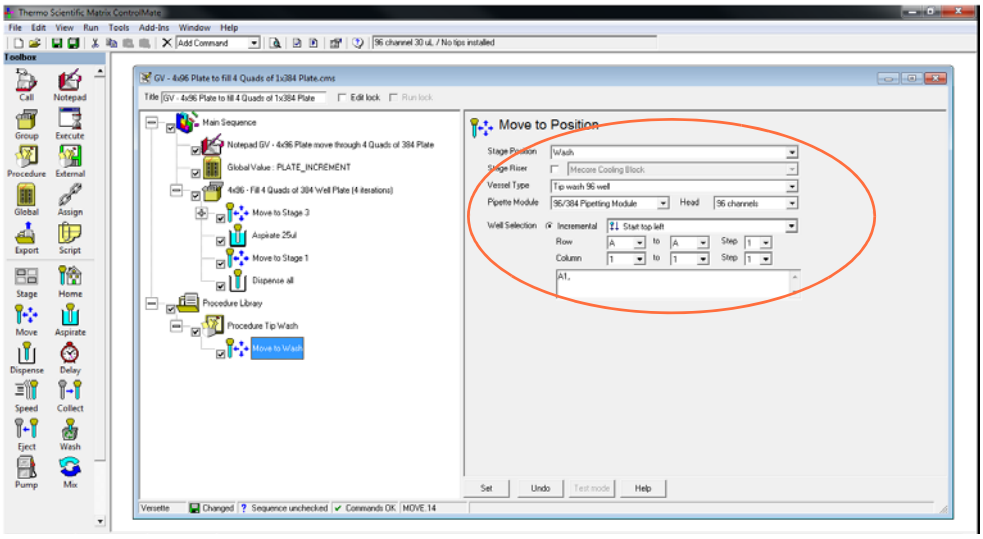
13. Click on the Procedure Library.



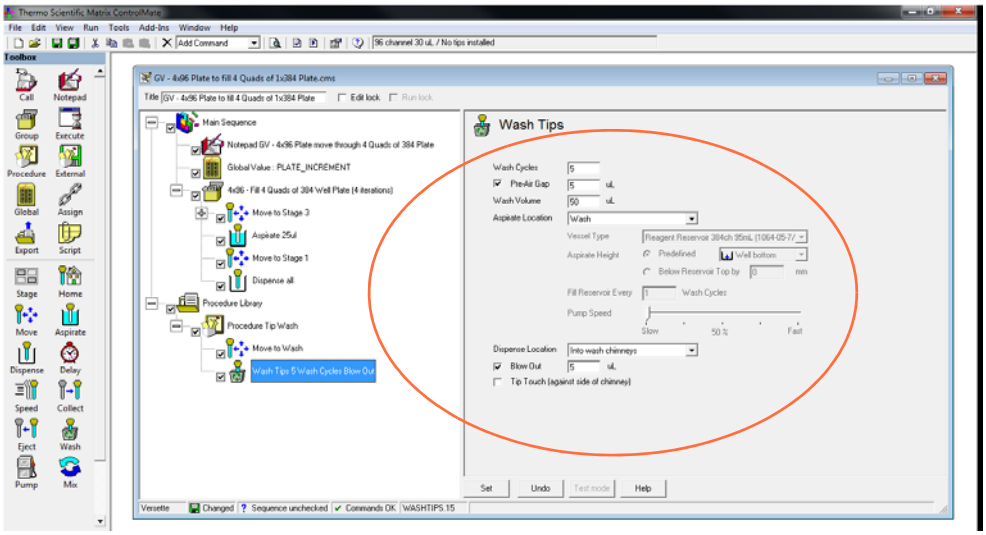
14. Click on the Procedure  icon and enter the title “Tip Wash” as shown then select "Set".



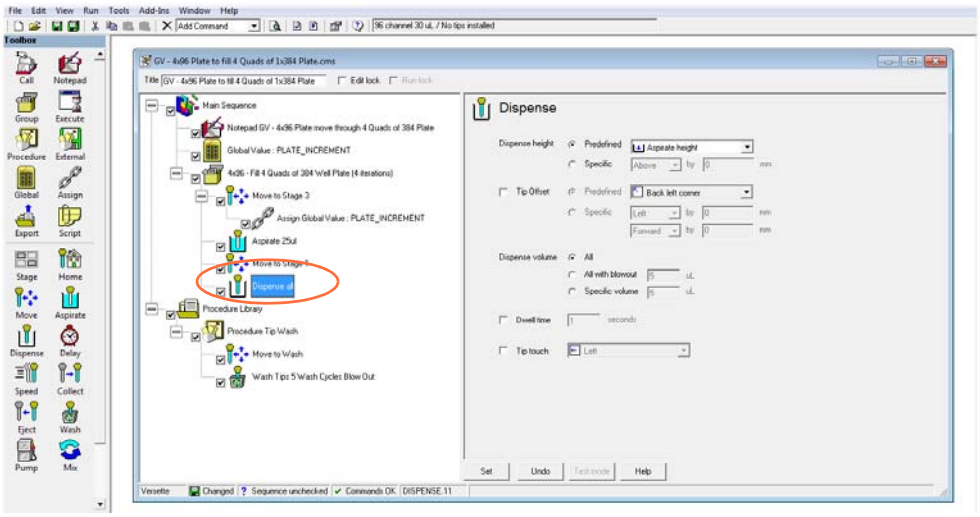
15. Click on the Move  icon, select “Wash” for the Stage Position, fill in the entries as shown, then select "Set".



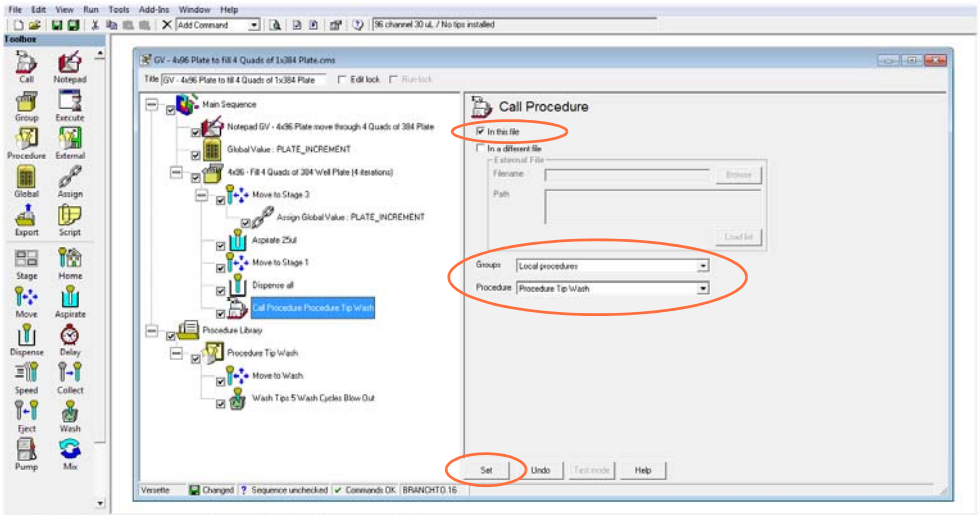
16. Click on the Wash Tips  icon, then enter the following:
Wash Cycles: 5
Pre-Air Gap: 5 µl
Wash Volume: 50 µl
Blow Out: 5 µL,
then select "Set".



17. Click on the “Dispense All” icon in the main sequence, as shown below:



18. Click on the Call Procedure  icon.
Select “In this file” then
Groups: “Local procedures”
Procedure: “Procedure Tip Wash”,
then select “Set”.



Example Sequence 6: Use of Multiple Global Variables

The following sample protocol details the use of three global values which prompt the user each time the protocol is run to enter the number of preconditioning cycles, number of sample capture cycles, a Buffer Rinse cycle followed by a water rinse cycle, then the final elution cycles.

This is an advanced procedure which is available for your use and modification. Please review all prior example sequences to better understand the steps and settings which are summarized on the following pages. The protocol utilises MSIA tips which can be used for high-throughput immunoaffinity sample preparation in the ***Versette*** system.

The steps in the MSIA example protocol are:

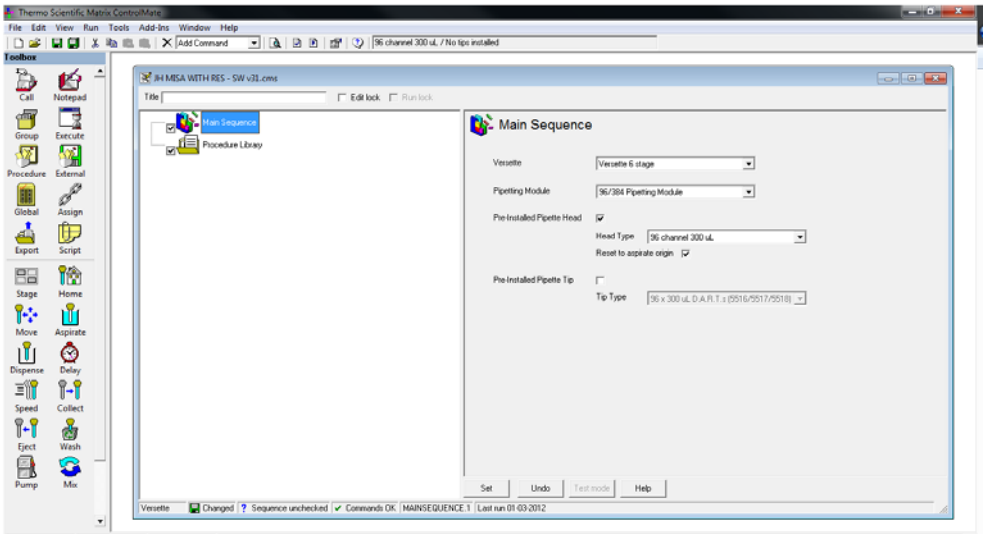
1. Precondition – which ensures that the MSIA tip is at the correct conditions (pH, salinity etc.) for the binding of the sample to the monolith
2. Sample Capture – where the sample is run across the MSIA tips a number of times with the intent that on one of the travels through the tip the sample binds to the monolith
3. Buffer Rinse – this step allows for the rinsing of all non-bound proteins off of the monolith, with the intent of removing any proteins that are not of interest.
4. Water Rinse – prepares the monolith for the elution buffer, by attempting to remove all traces of the precondition/sample/rinse buffer (which maximizes binding of the protein to the monolith)
5. Elution – used on the MSIA tip, changes the conformation (shape) of the protein from actively bound to the monolith, to freely flowing in the elution buffer.

Example Sequence 6: MSIA, Elution with Global Variables Program Creation

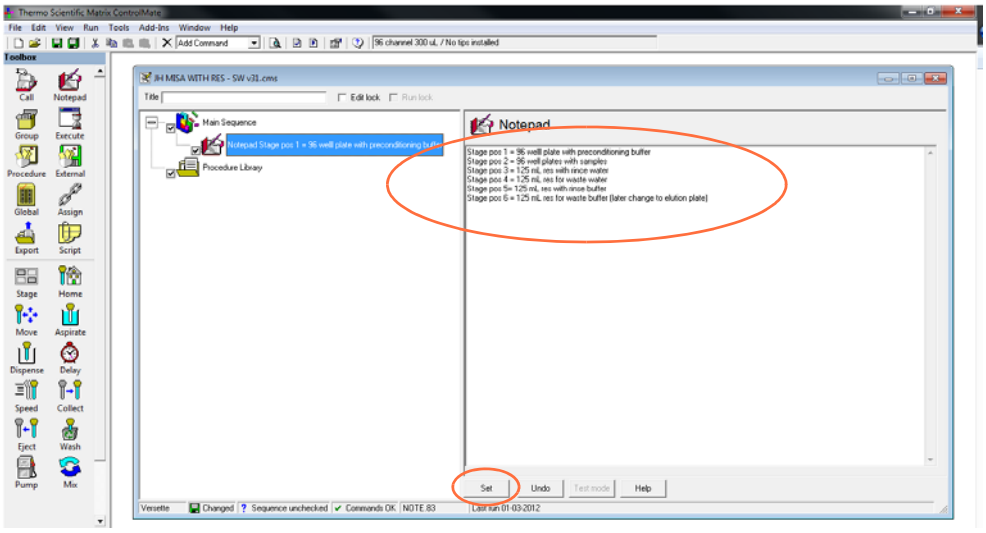
1. Verify that communication is properly set with the ***Versette*** system, and that the configuration has been properly set. Refer to the "*Configuring ControlMate*" section of this manual for details.

2. Under the Main Sequence command, verify the correct head and tips are selected as appropriate. This sequence assumes that pipette tips are already loaded into the system.

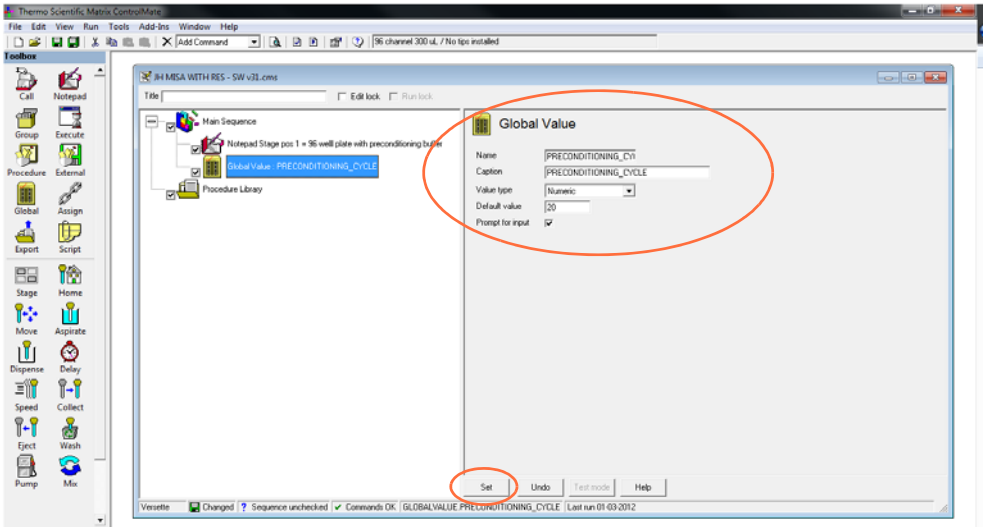
3. Select "**New Sequence File**" from the File menu or click the new sequence button on the main menu.



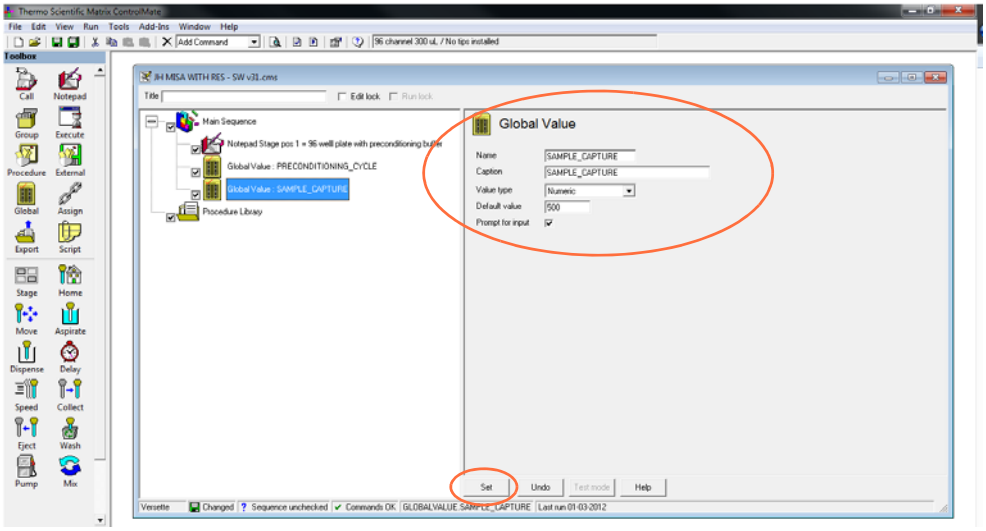
4. Click on the Notepad icon then enter the configuration notes for the stage layout. The example is shown below.



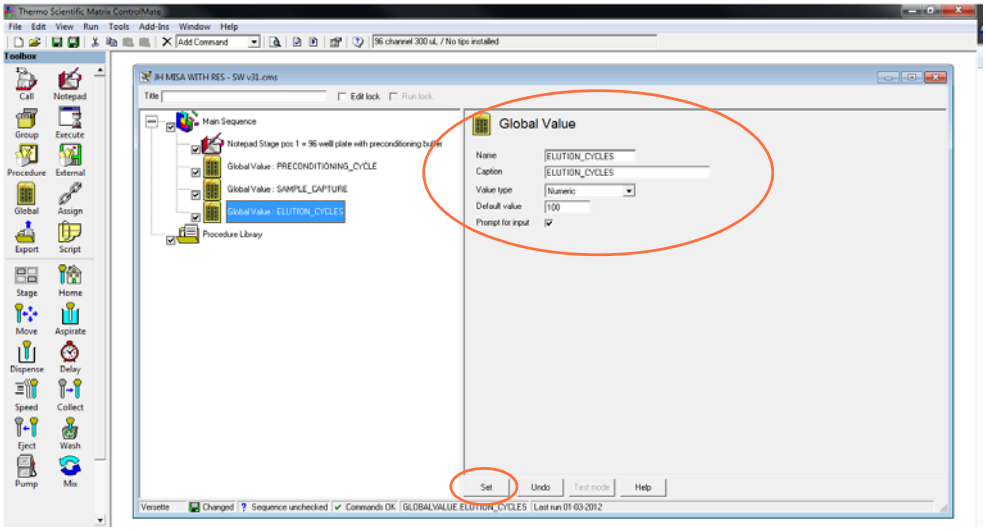
5. Click on the Global Value  icon then enter a name “PRECONDITIONING_CYCLE” and other entries as shown below. Be sure to select the “Prompt for input” checkbox to display a prompt to the user at run-time to allow the user to enter a new value for the “PRECONDITIONING_CYCLE” global variable.



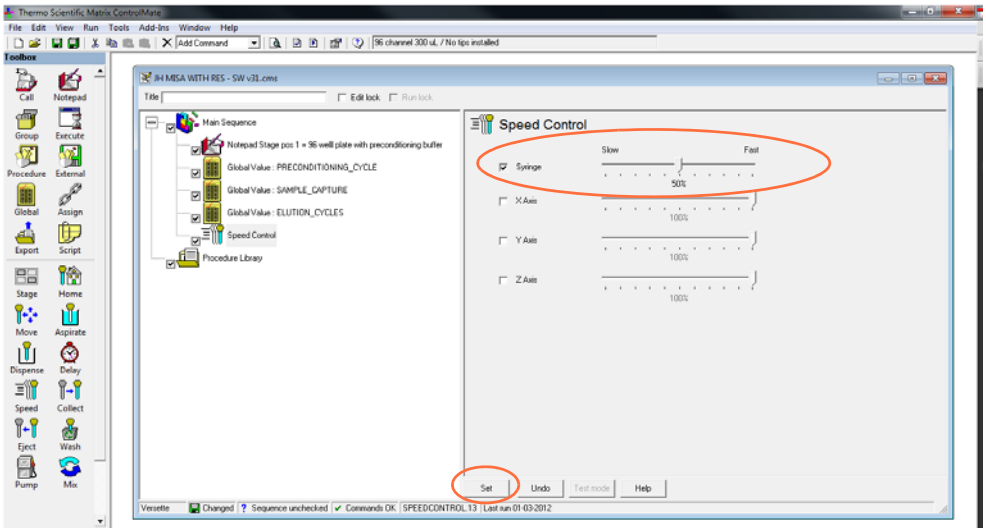
6. Click on the Global Value  icon then enter a name “SAMPLE_CAPTURE” and other entries as shown below. Be sure to select the “Prompt for input” checkbox to display a prompt to the user at run-time to allow the user to enter a new value for the “SAMPLE_CAPTURE” global variable.



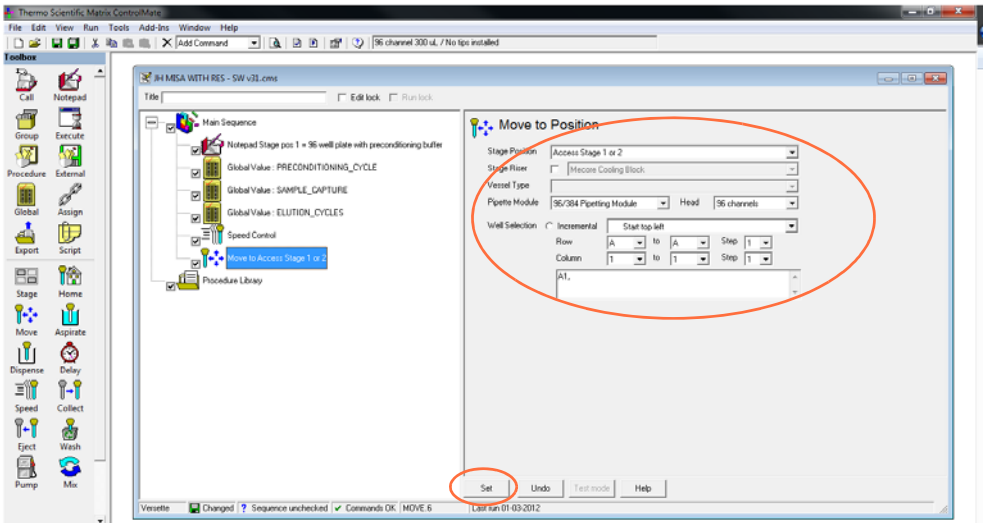
7. Click on the Global Value  icon then enter a name “ELUTION_CYCLES” and other entries as shown below. Be sure to select the “Prompt for input” checkbox to display a prompt to the user at run-time to allow the user to enter a new value for the “ELUTION_CYCLES” global variable.



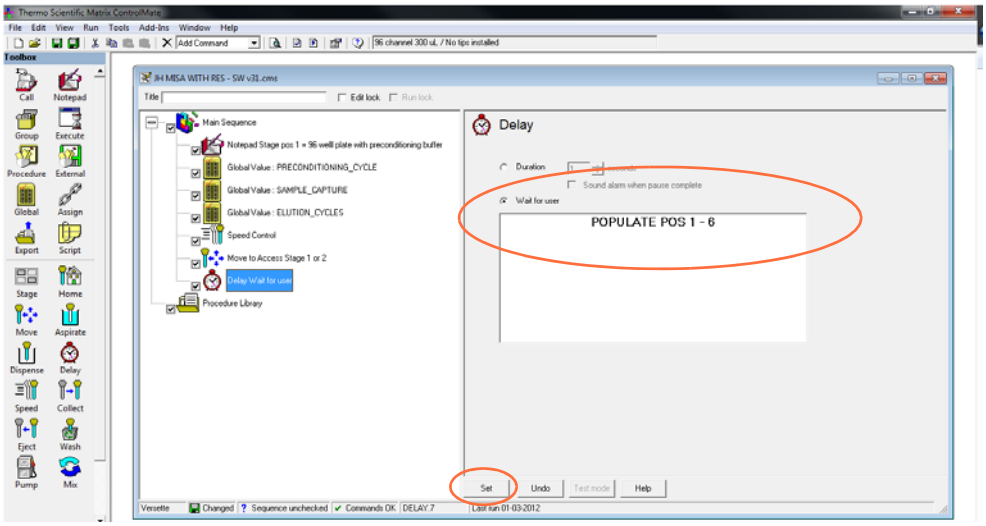
8. Click on the Speed Control  icon then select the “Syringe” (place a checkmark as shown), slide the Syringe speed control to 50% as shown, then select “Set”.



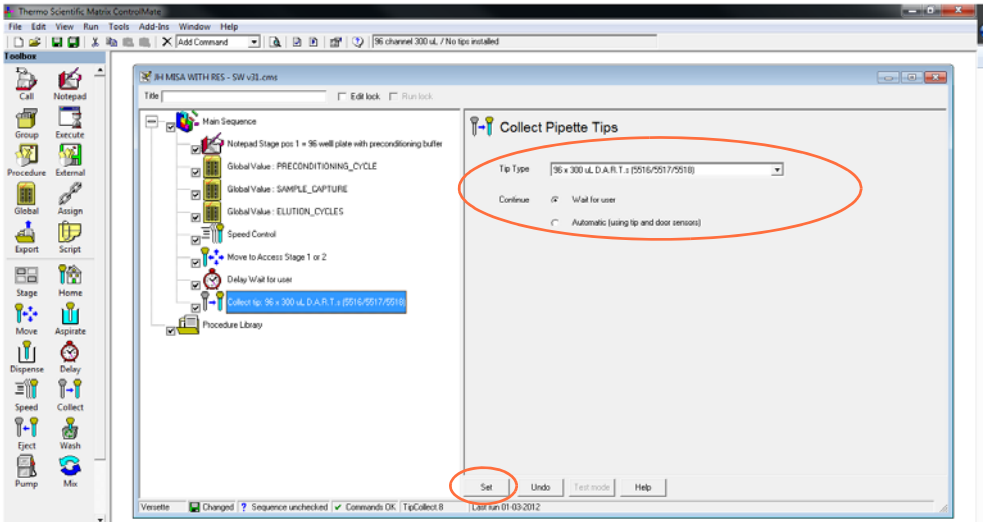
9. Click on the Move  icon, select “Move to Access Stage 1 or 2 (see screen), enter variables as shown, then select "Set". This will position the stages for access by the user.



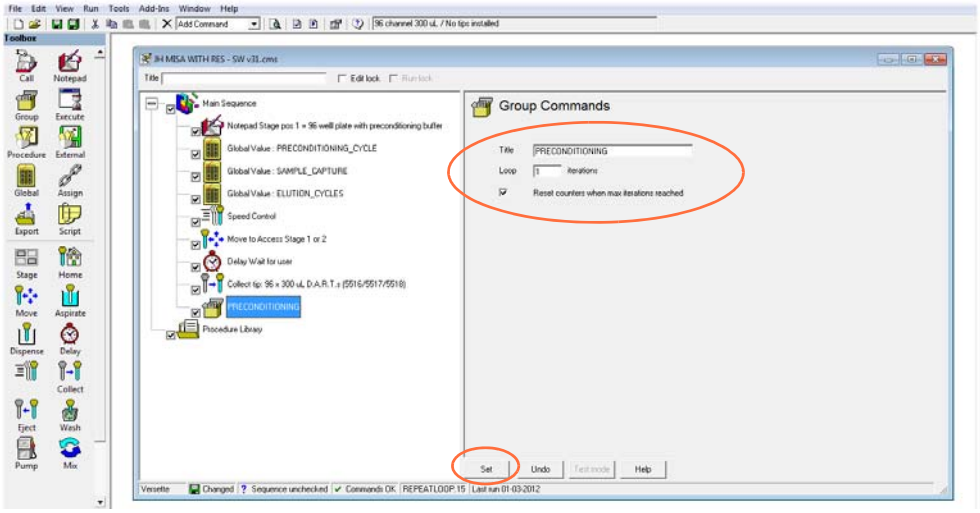
10. Click on the Delay  icon, enter a message to the user as shown, then select "Set".



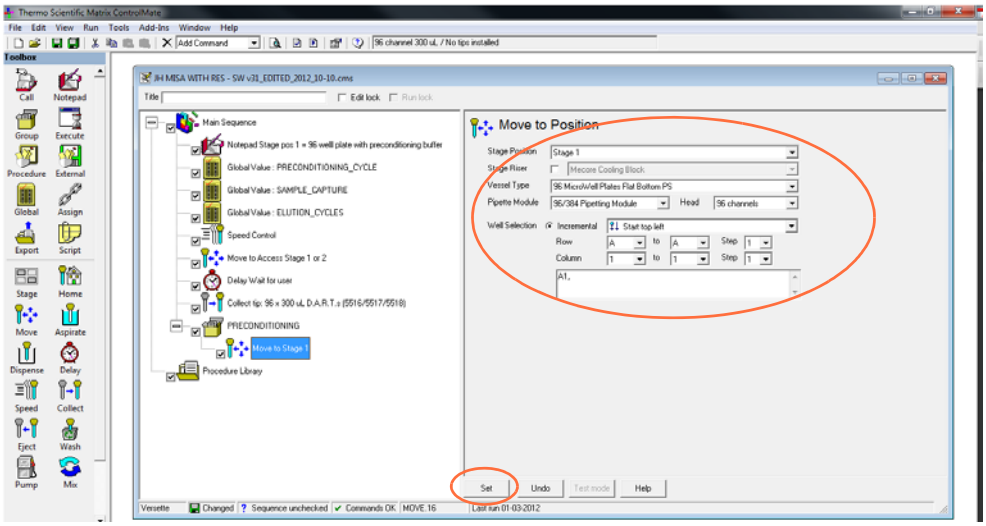
11. Click on the Collect Pipette Tips  icon, select the Tip Type as shown, and select “Wait for user” to delay processing while the user loads the tips, then select "Set".



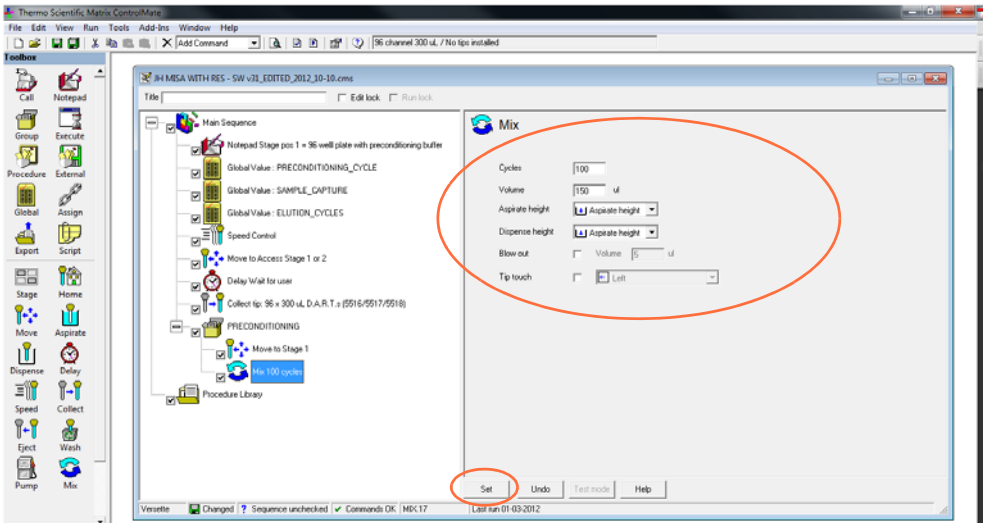
12. Click on the Group  icon then enter a Title for the group, in this example “PRECONDITIONING”, select items shown, then select "Set".
This group will be used to perform the preconditioning (mix) cycles.



13. Click on the Move  icon, select Stage 1 (see screen), enter variables as shown, then select "Set".

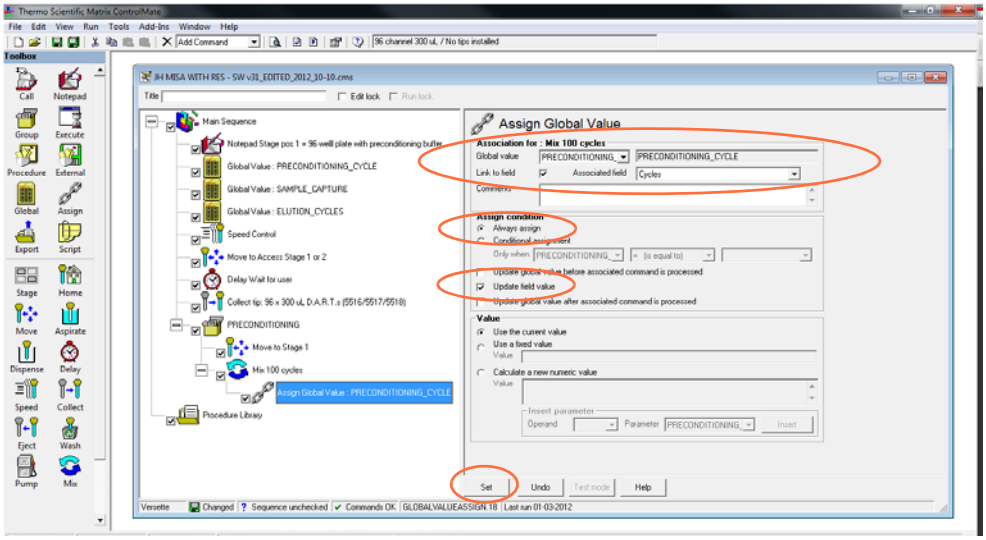


14. Click on the Mix  icon, select 100 cycles, 150 µl volume, aspirate and dispense heights as shown, then select "Set".



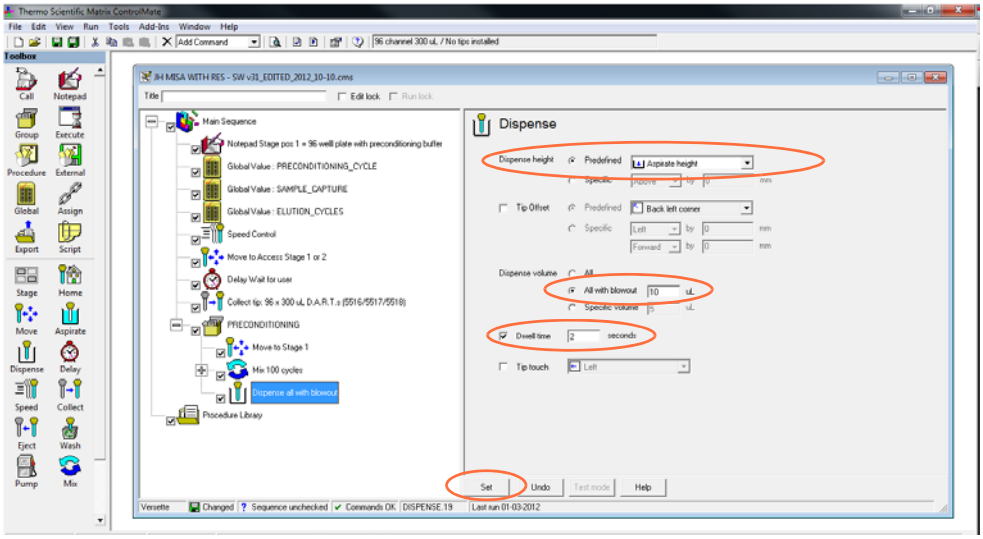
15. Click on the Assign Global Value  icon, enter variables as shown, then select "Set".

Note! This assignment of the Global Value PRECONDITIONING_CYCLE will allow the user's input at run-time to override the default number of mix cycles.

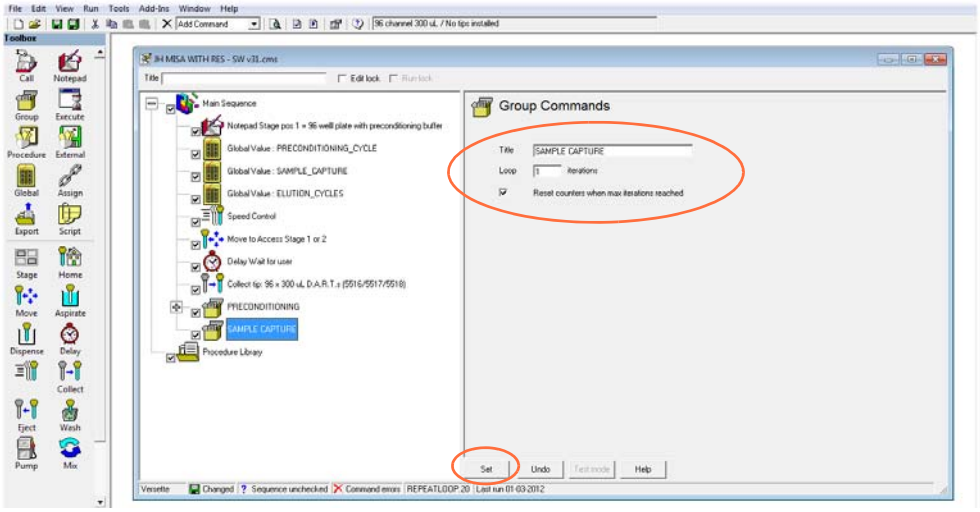


16. Click on "-" symbol next to the Mix command to collapse the step.

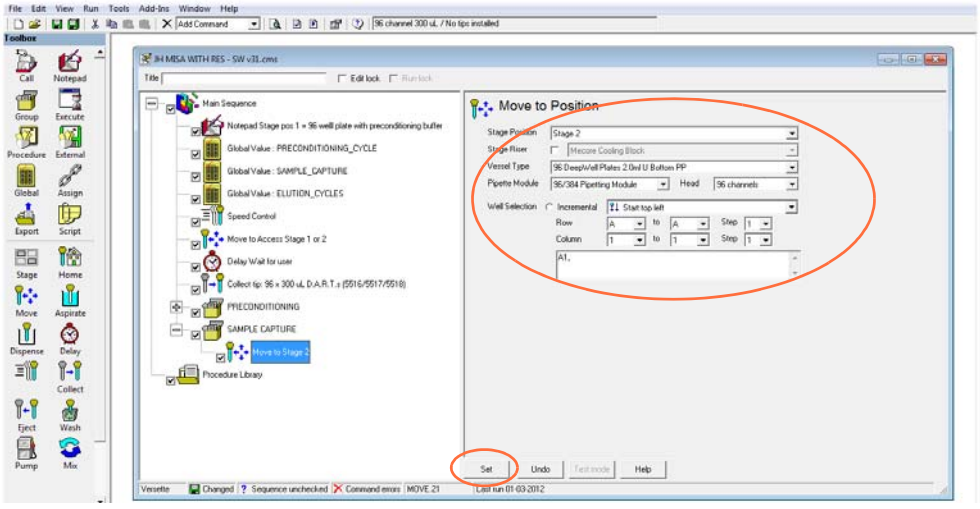
17. Click the Dispense  icon, select the Predefined Aspirate Height, and the Dispense volume of "All with blowout 10 µL", a Dwell time of 2 seconds, then select "Set".



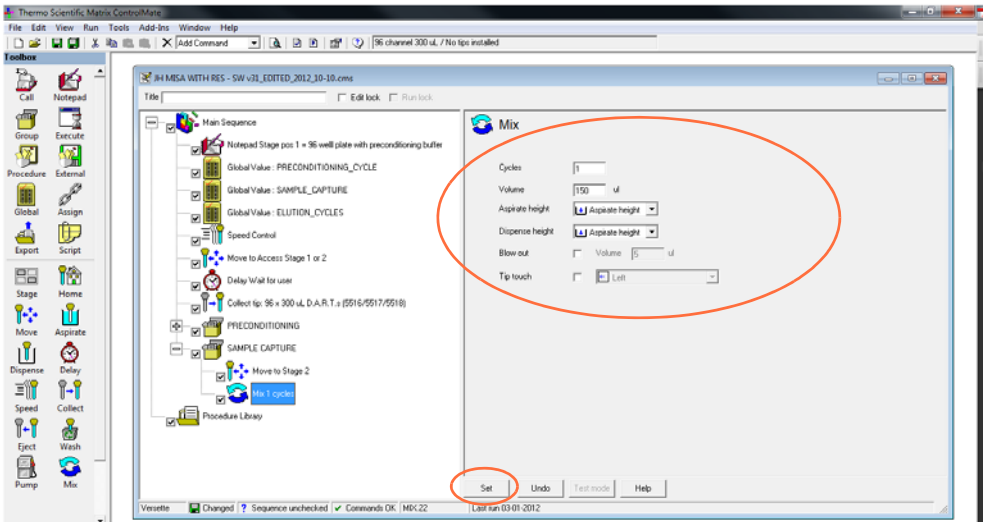
18. Click on "-" symbol next to the PRECONDITIONING group command to collapse the step.
19. Click on the Group  icon then enter a Title for the group, in this example "SAMPLE CAPTURE", select items shown, then select "Set".



20. Click on the Move  icon, select Stage 2 (see screen), enter variables as shown, then select "Set".

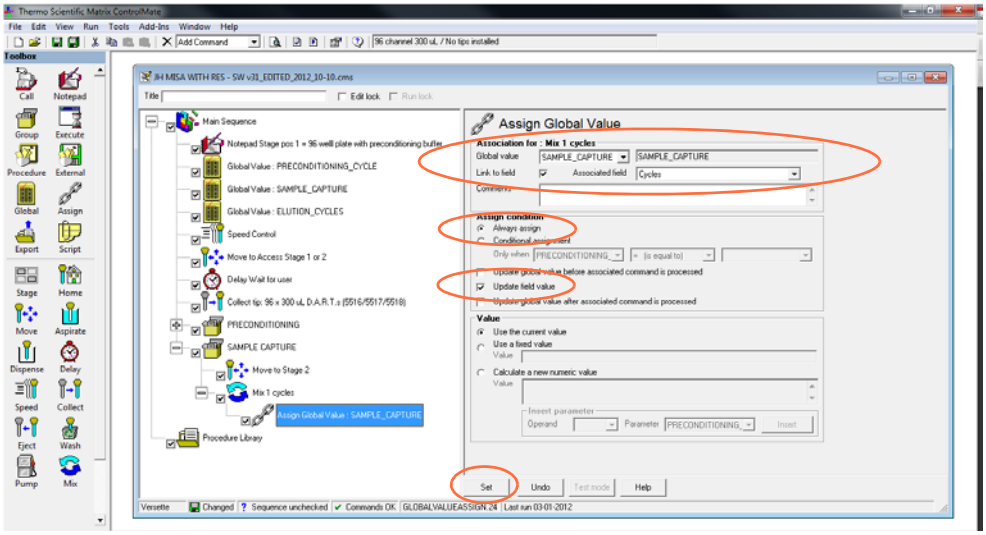


21. Click on the Mix  icon, select 1 cycle, 150 µl volume, aspirate and dispense heights as shown, then select "Set".



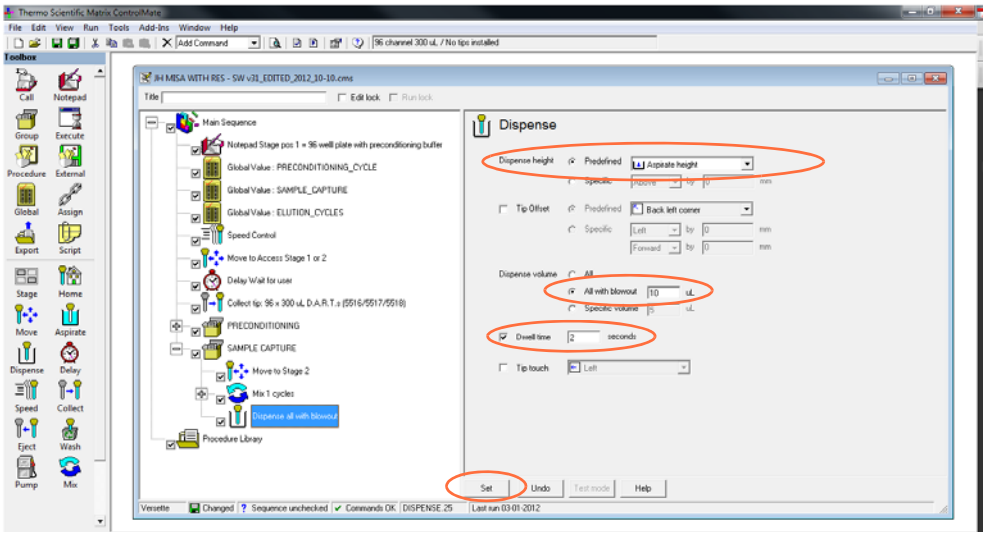
22. Click on the Assign Global Value  icon, enter variables as shown, then select "Set".

Note! This assignment of the Global Value SAMPLE_CAPTURE will allow the user's input at run-time to override the default number of mix cycles for this sample capture step.



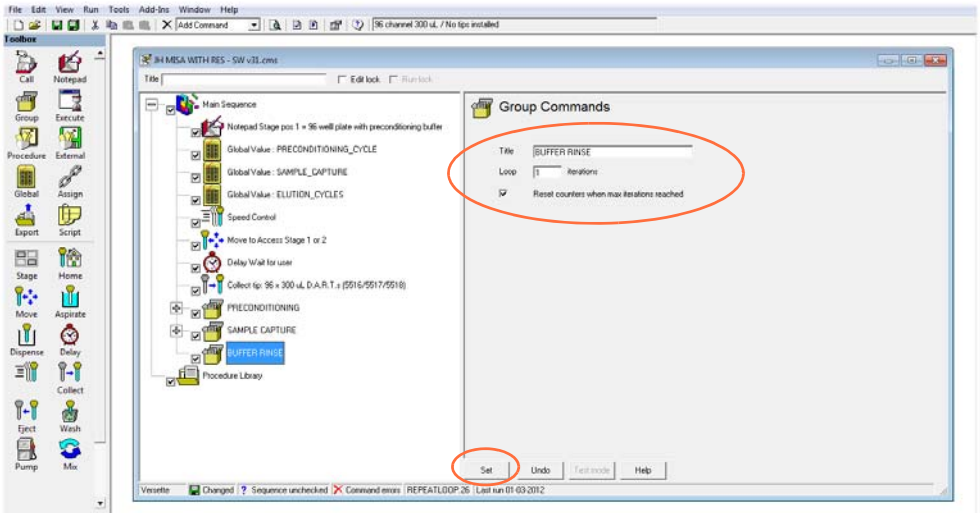
23. Click on "-" symbol next to the Mix command to collapse the step.

24. Click the Dispense  icon, select the Predefined Aspirate Height, and the Dispense volume of “All with blowout 10 µL”, a Dwell time of 2 seconds, then select "Set".

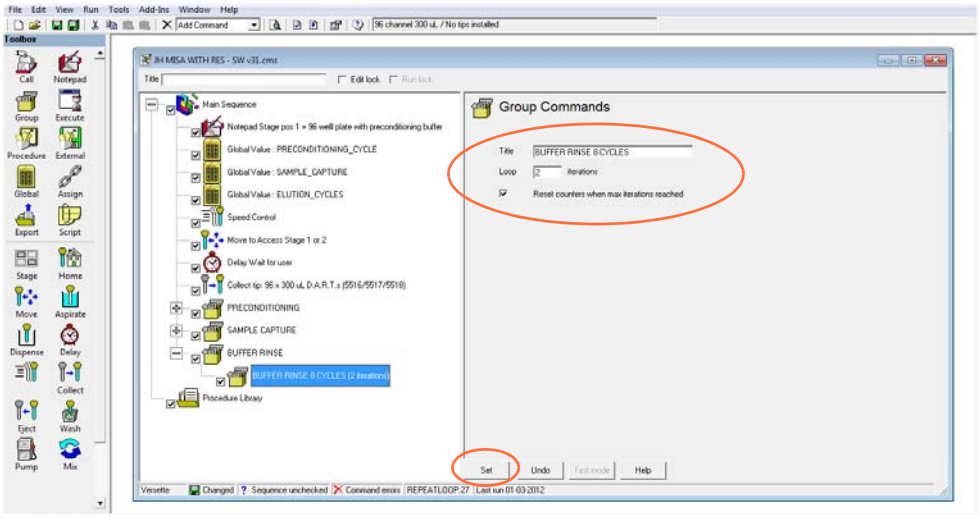


25. Click on “-” symbol next to the SAMPLE CAPTURE group command to collapse the step.

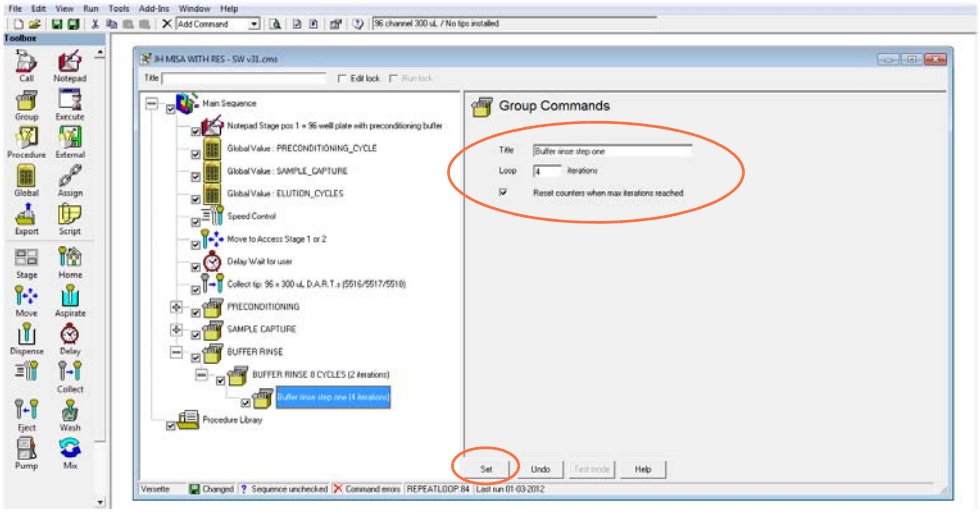
26. Click on the Group  icon then enter a Title for the group, in this example “BUFFER RINSE”, select items shown, then select "Set".



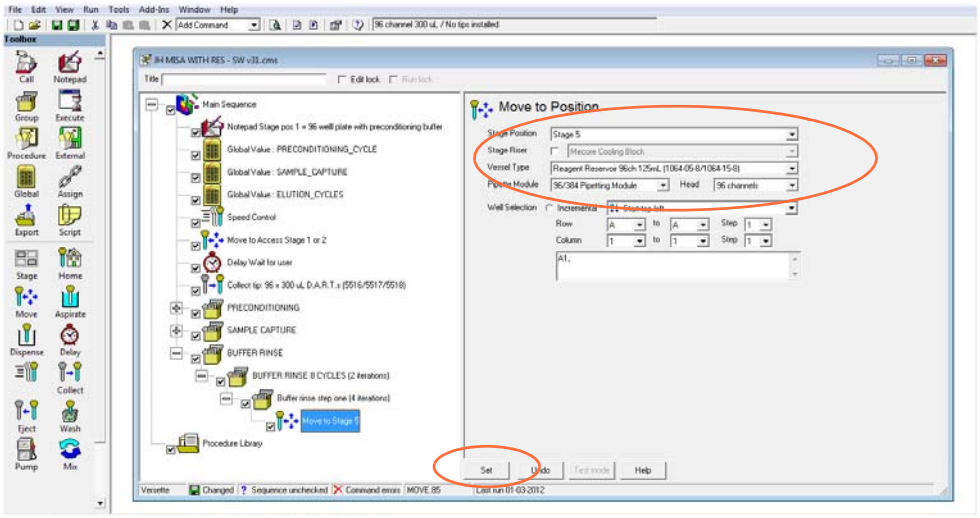
27. Click on the Group  icon then enter a Title of “BUFFER RINSE 8 CYCLES (2 iterations)”, select items shown, then select "Set".



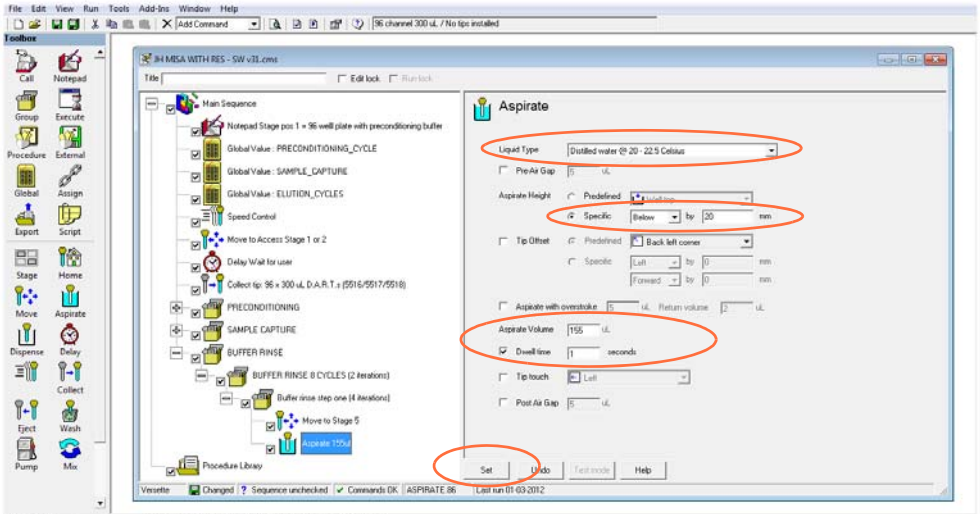
28. Click on the Group  icon then enter a Title of “Buffer rinse step one (4 iterations), select items shown, then select "Set".



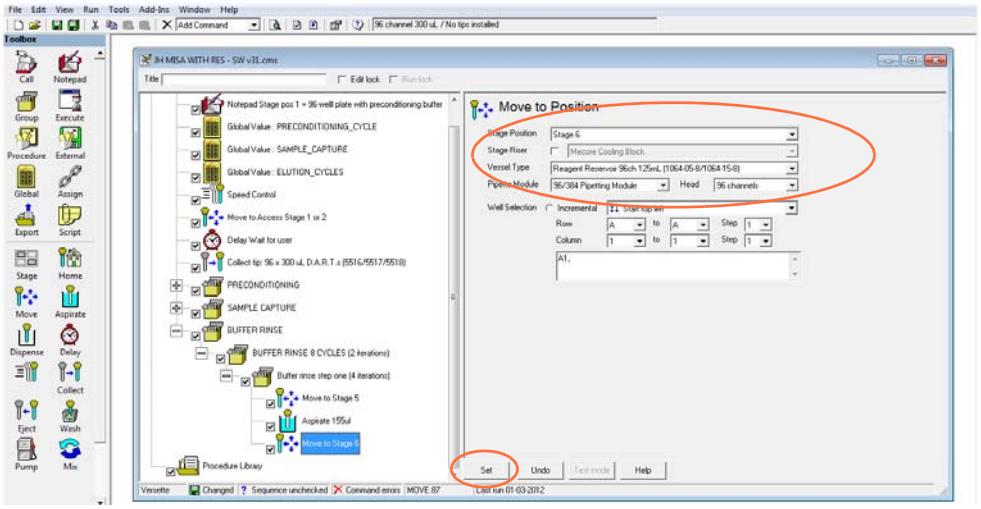
29. Click on the Move  icon, select Stage 5 (see screen), enter items as shown then select "Set".



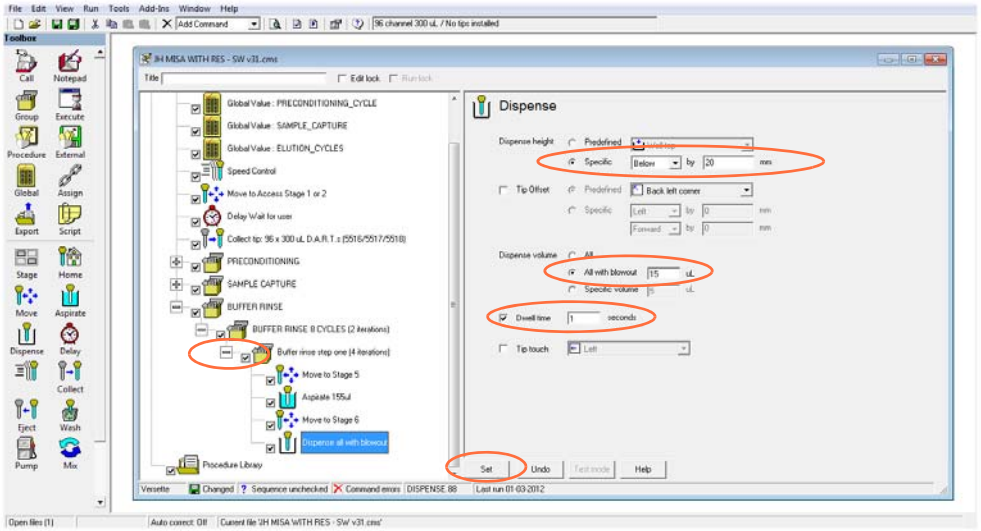
30. Click on the Aspirate  icon, select the Liquid Type, Aspirate Height (Specific, Below 20 mm), Aspirate Volume of 155 µL, and Dwell time of 1 second, then select "Set".



31. Click on the Move  icon, select Stage 6 (see screen), enter variables as shown, then select "Set".

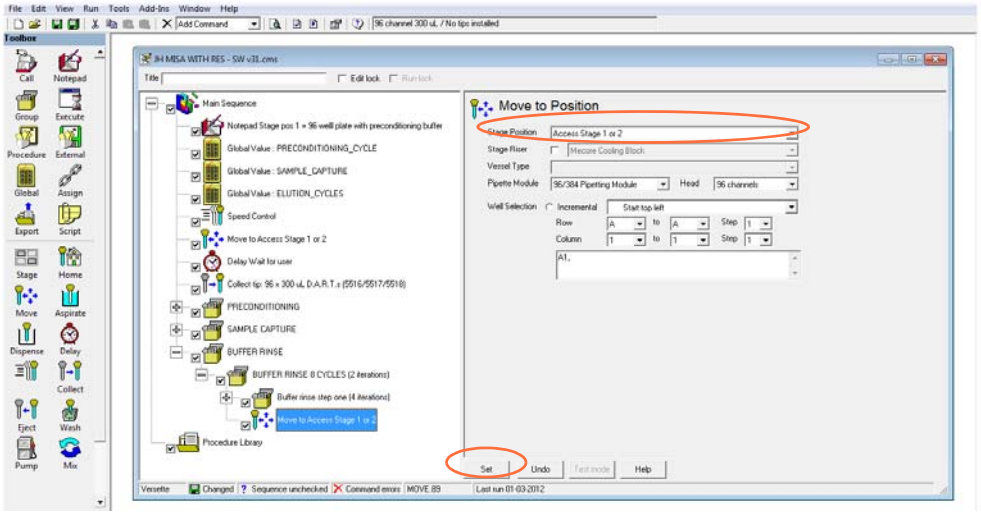


32. Click the Dispense  icon, select Dispense Height (Specific, Below 20 mm), Dispense volume of “All with blowout 15 µL”, and a Dwell time of 1 second, then select "Set".

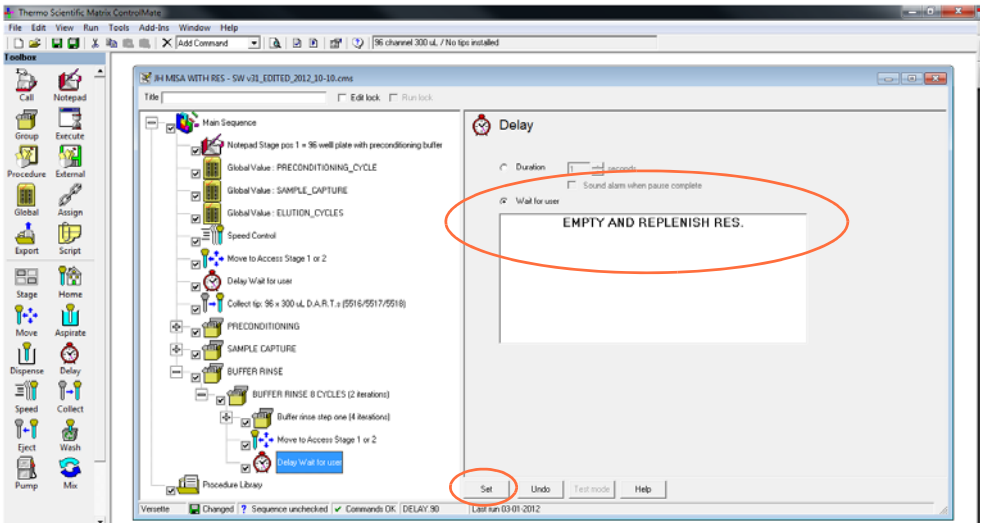


33. Click on “-” symbol next to the “Buffer rinse step one (4 iterations)” group command to collapse the step.

34. Click the Move  icon, select “Access Stage 1 or 2”, then select "Set".

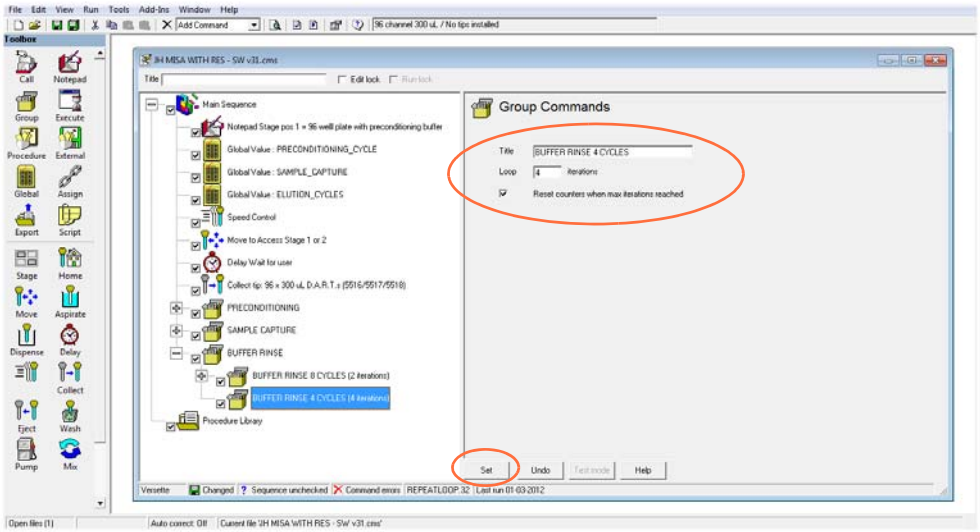


35. Click on the Delay  icon, enter a message to the user as shown, then select "Set".

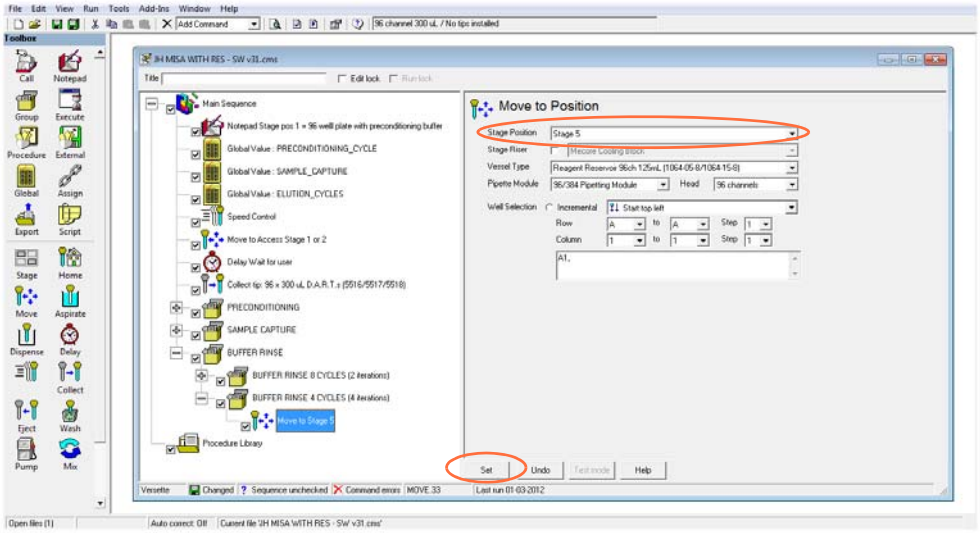


36. Click on “-” symbol next to the “BUFFER RINSE 8 CYCLES (2 iterations)” group command to collapse the step.

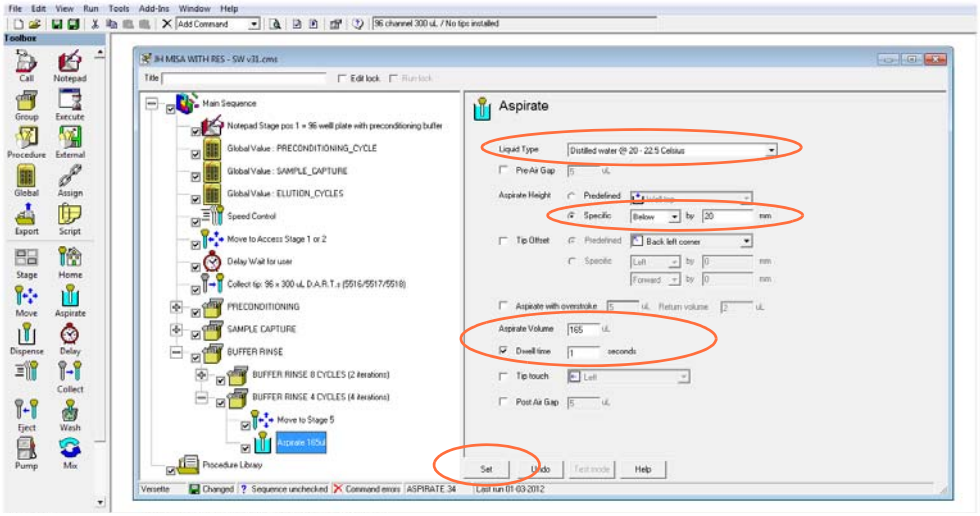
37. Click on the Group  icon then enter a Title of “BUFFER RINSE 4 CYCLES (4 iterations), select items shown, then select "Set".



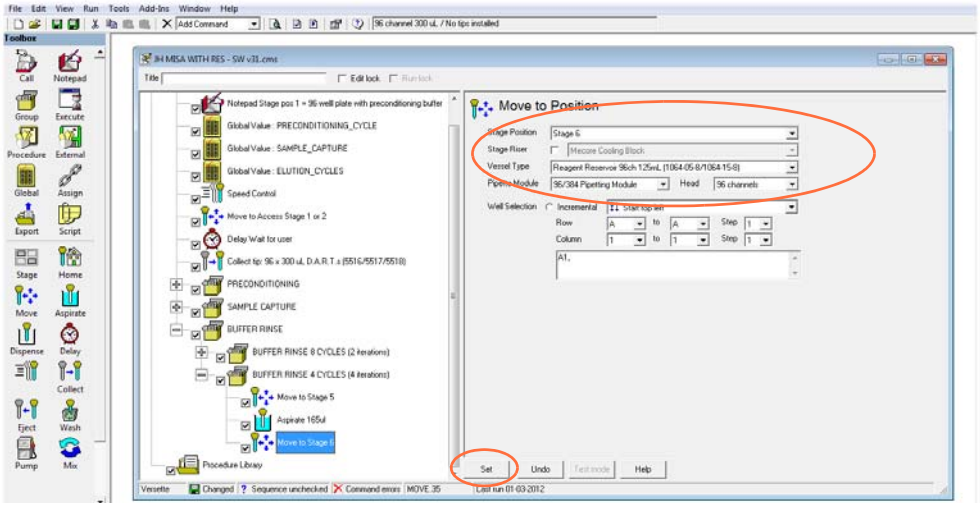
38. Click the Move  icon, select “Stage 5”, then select "Set".



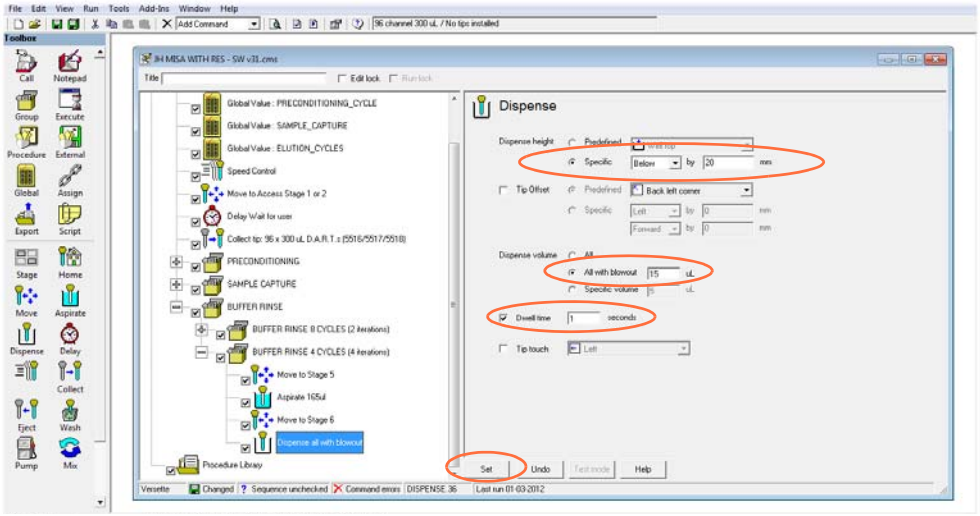
39. Click on the Aspirate  icon, select the Liquid Type, Aspirate Height (Specific, Below 20 mm), Aspirate Volume of 165 µL, and Dwell time of 1 second, then select “Set”.



40. Click on the Move  icon, select Stage 6 (see screen), enter variables as shown, then select "Set".

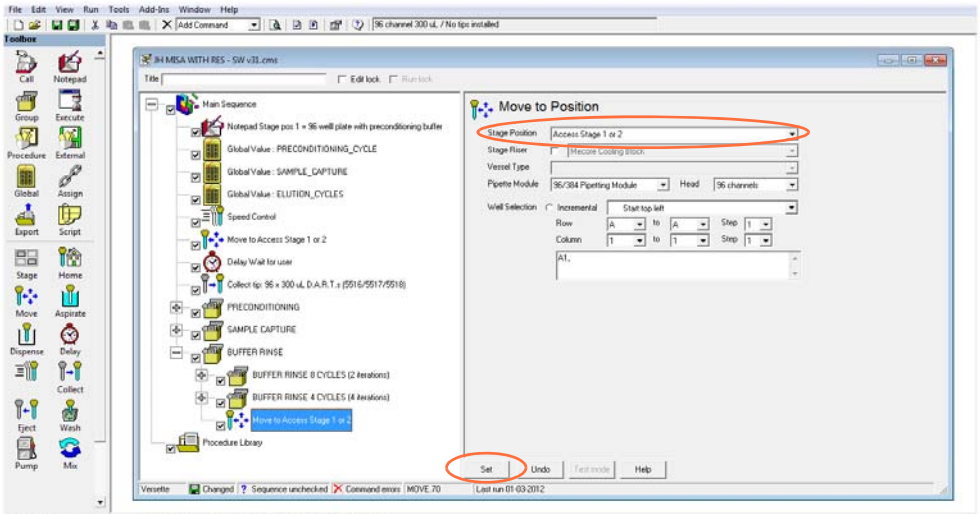


41. Click the Dispense  icon, select Dispense Height (Specific, Below 20 mm), and the Dispense volume of “All with blowout 15 µL”, a Dwell time of 1 second, then select "Set".

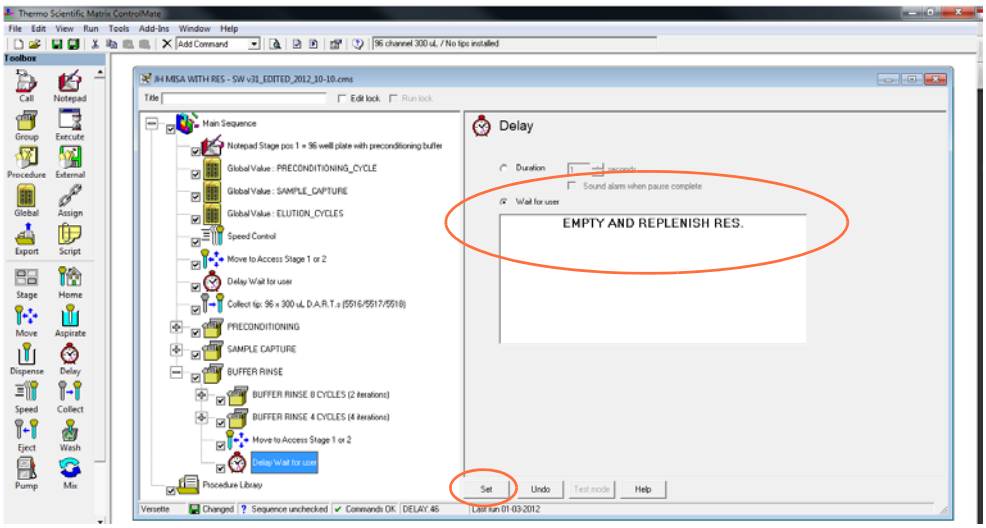


42. Click on “-” symbol next to the BUFFER RINSE 4 CYCLES (4 iterations) group command to collapse the step.

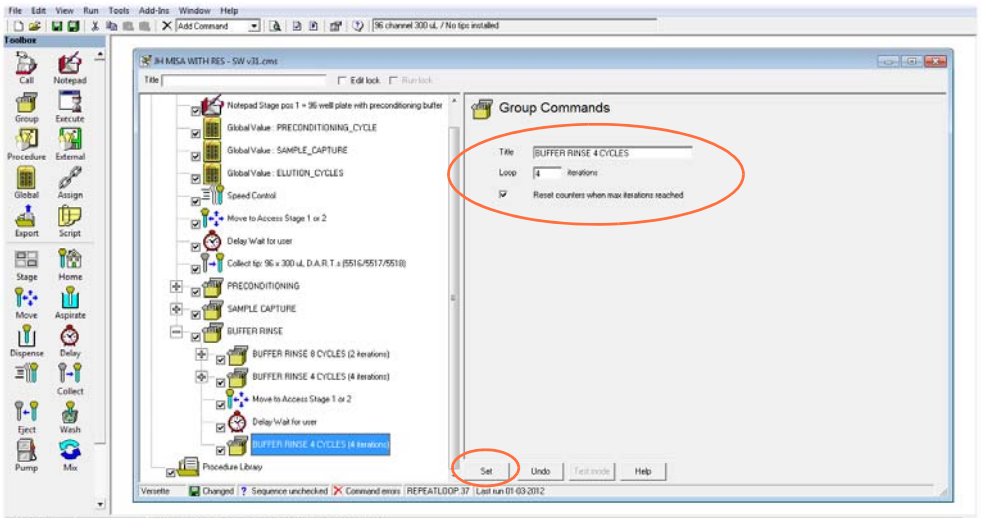
43. Click the Move  icon, select “Access Stage 1 or 2”, then select "Set".



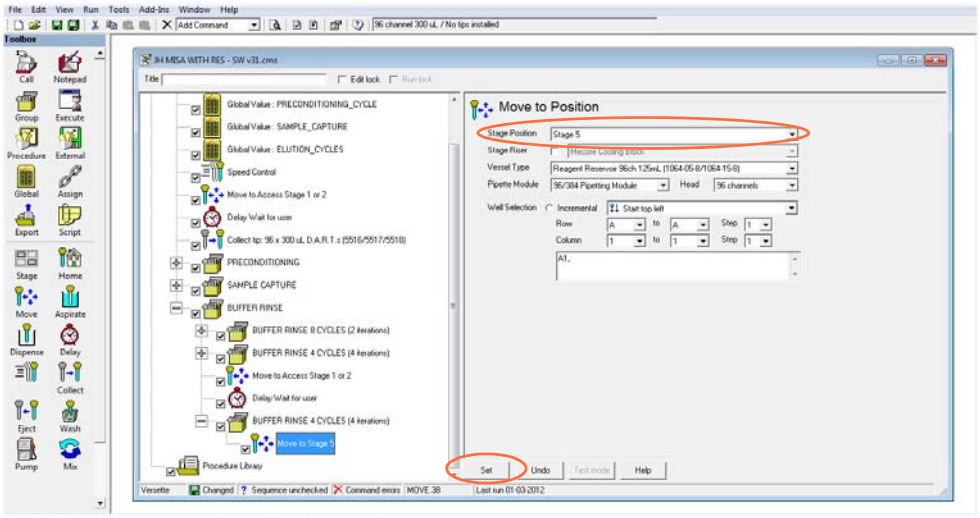
44. Click on the Delay  icon, enter a message to the user as shown, then select "Set".



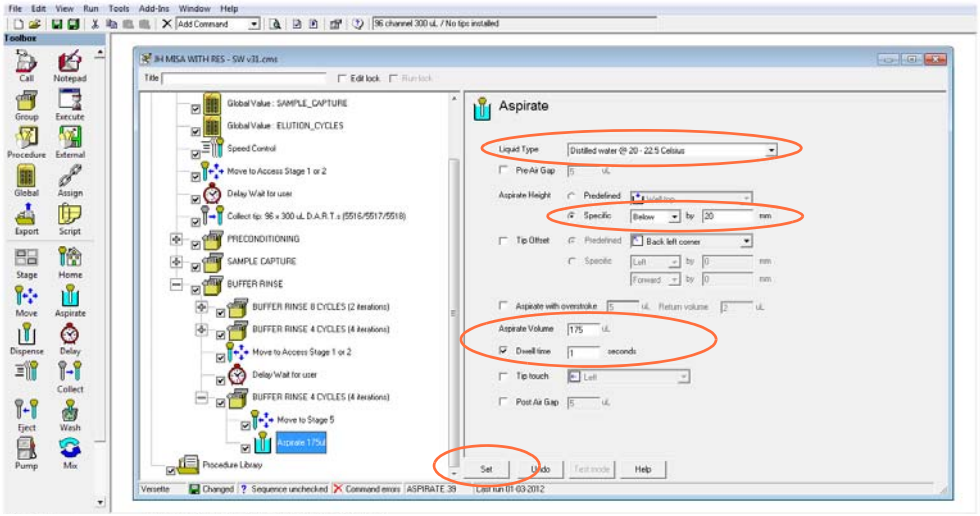
45. Click on the Group  icon then enter a Title of “BUFFER RINSE 4 CYCLES (4 iterations), select items shown, then select "Set".



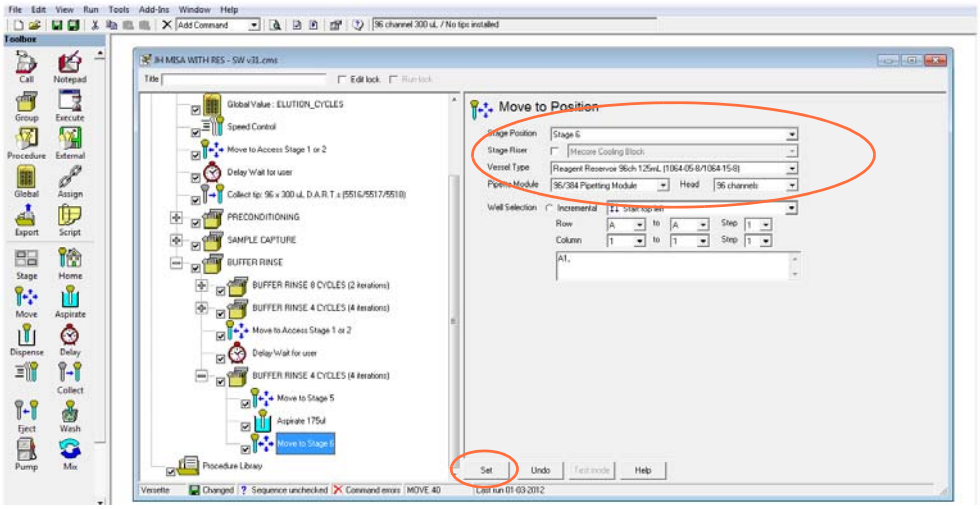
46. Click the Move  icon, select “Stage 5”, then select "Set".



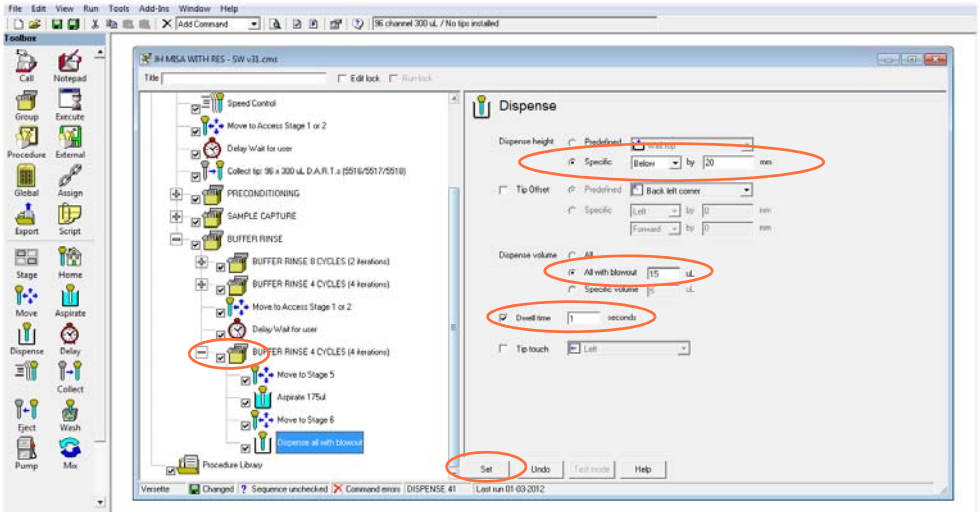
47. Click on the Aspirate  icon, select the Liquid Type, Aspirate Height (Below 20 mm), Aspirate Volume of 175 µL, and Dwell time of 1 second, then select “Set”.



48. Click on the Move  icon, select Stage 6 (see screen), enter variables as shown, then select "Set".

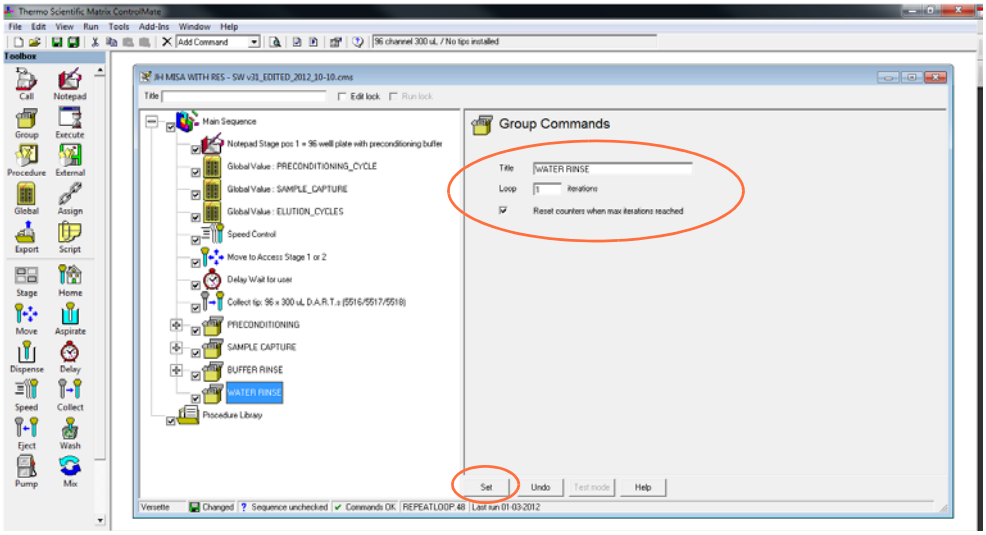


49. Click the Dispense  icon, select Dispense Height (Specific, Below 20 mm), and the Dispense volume of “All with blowout 15 µL”, a Dwell time of 1 second, then select "Set".

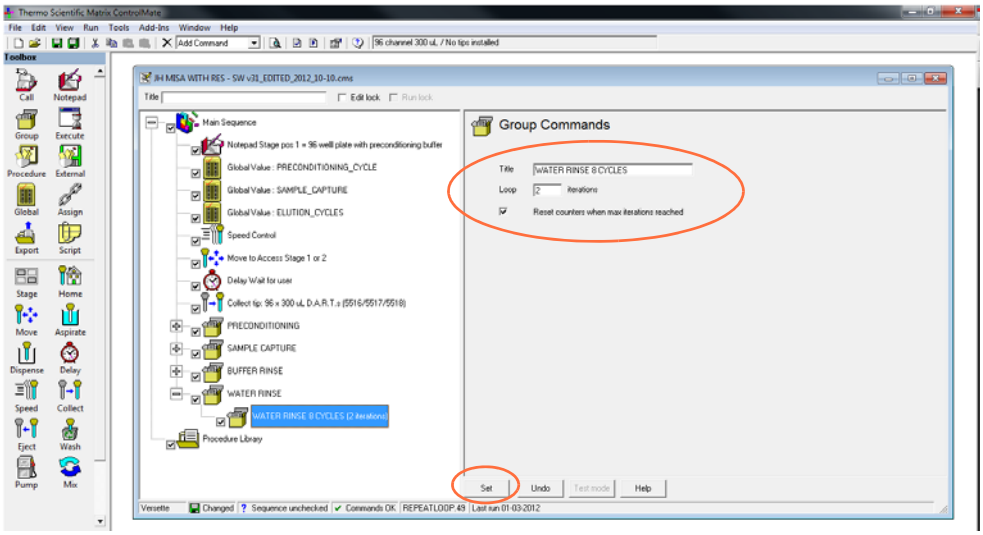


50. Click on “-” symbol next to the BUFFER RINSE group command to collapse the step.

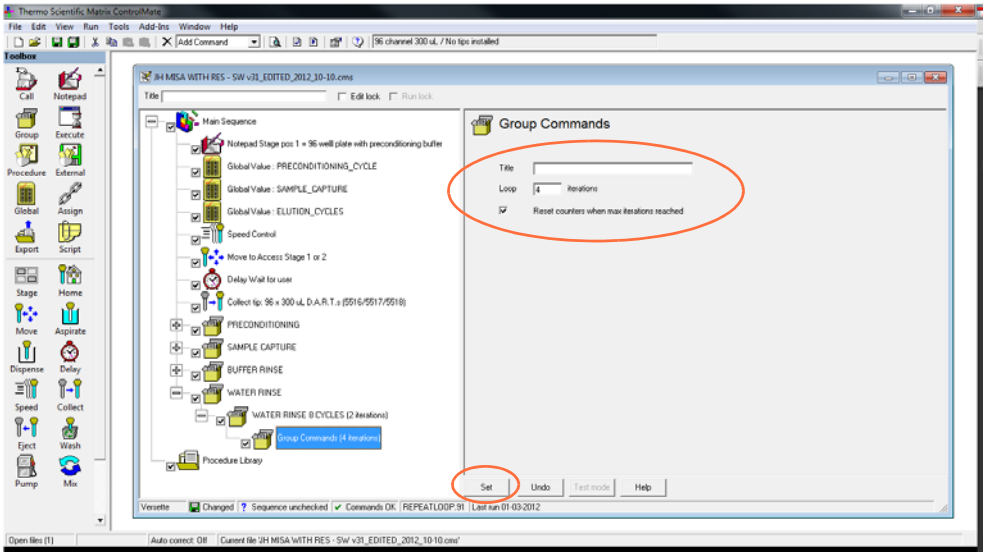
51. Click on the Group  icon then enter “WATER RINSE”, select items shown, then select "Set".



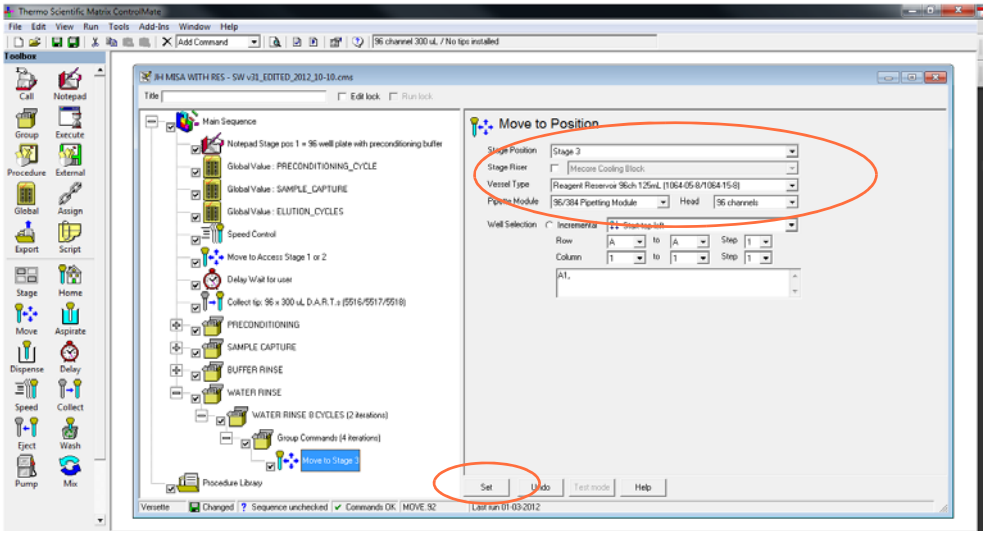
52. Click on the Group  icon then enter a Title of “WATER RINSE 8 CYCLES”, select items shown, then select "Set".



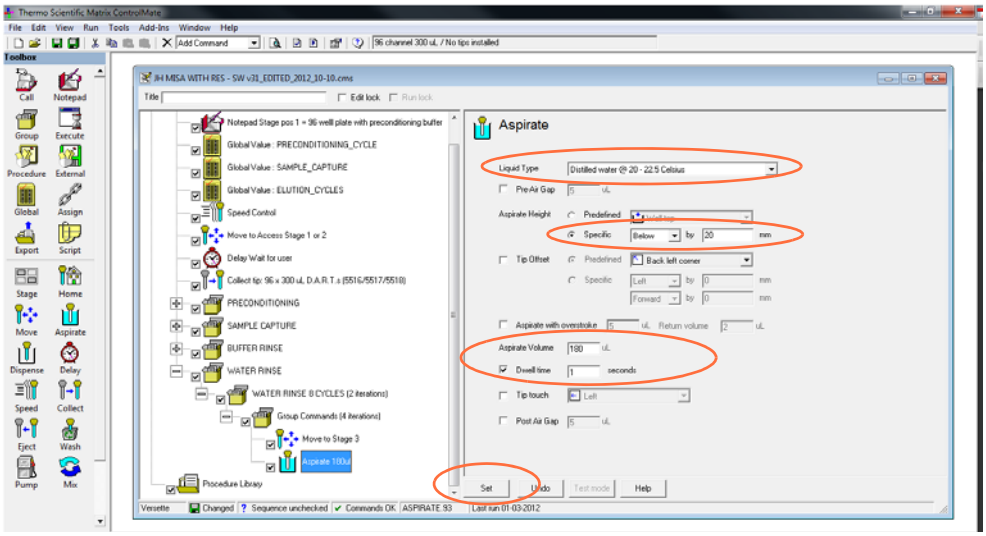
53. Click on the Group  icon then enter a 4 iterations, select items shown, then select "Set".



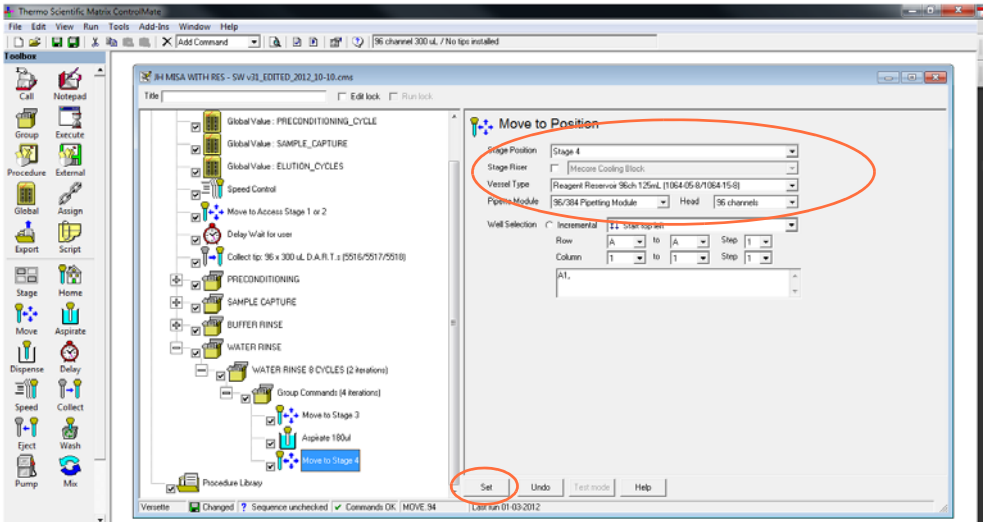
54. Click on the Move  icon, select Stage 3 (see screen), enter items as shown then select "Set".



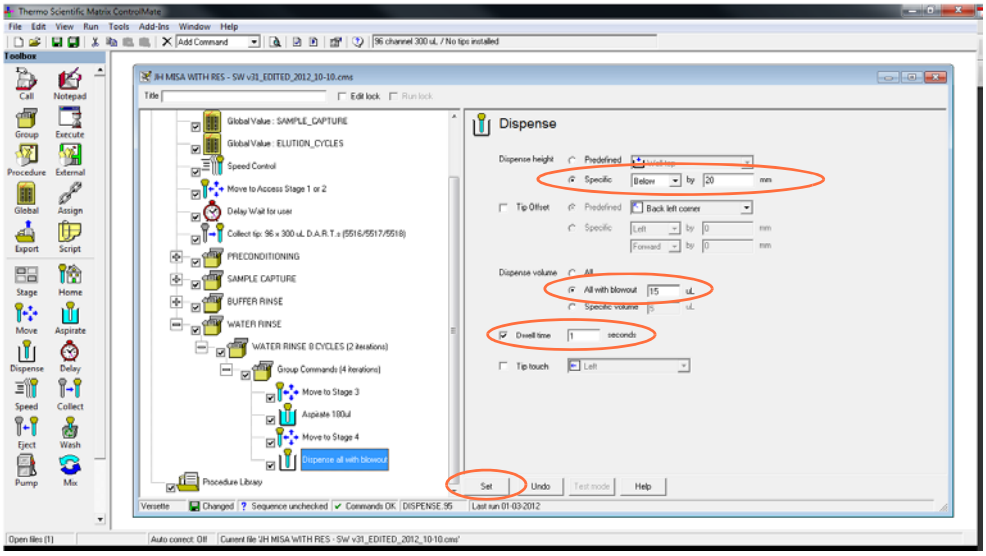
55. Click on the Aspirate  icon, select the Liquid Type, Aspirate Height (Specific, Below 20 mm), Aspirate Volume of 180 µL, and Dwell time of 1 second, then select “Set”.



56. Click on the Move  icon, select Stage 4 (see screen), enter variables as shown, then select "Set".

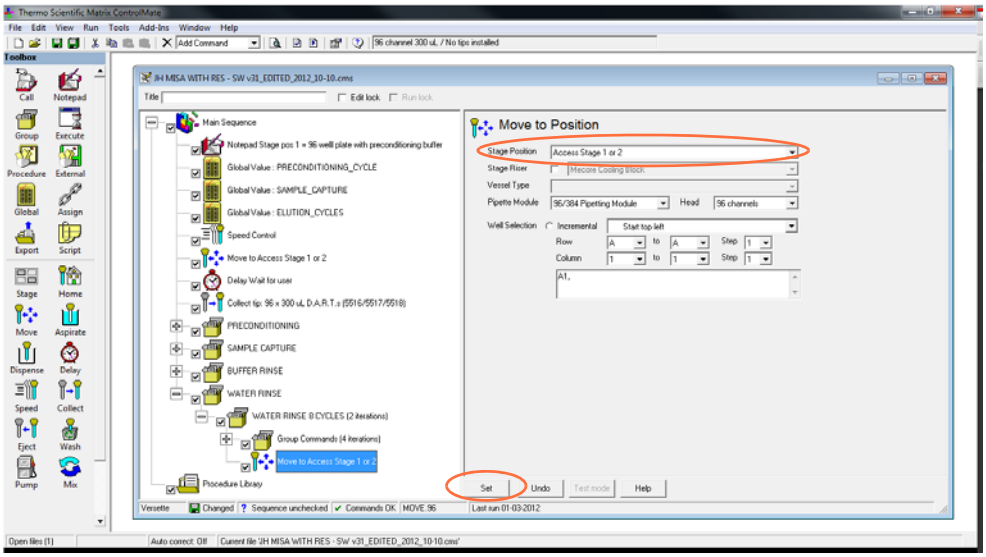


57. Click the Dispense  icon, select Dispense Height (Specific, Below 20 mm), Dispense volume of “All with blowout 15 µL”, and a Dwell time of 1 second, then select "Set".

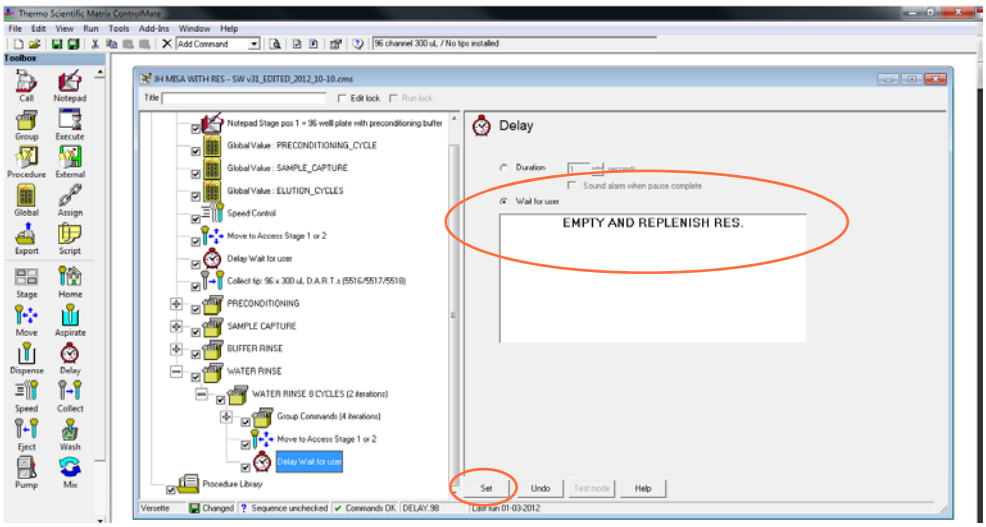


58. Click on “-” symbol next to the “Group commands (4 iterations)” group command to collapse the step.

59. Click the Move  icon, select “Access Stage 1 or 2”, then select "Set".

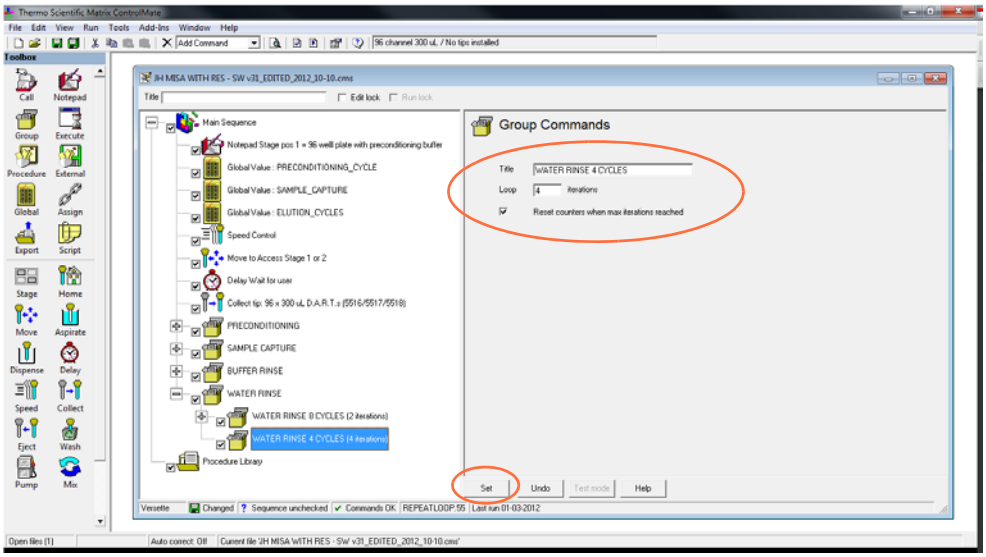


60. Click on the Delay  icon, enter a message to the user as shown, then select "Set".

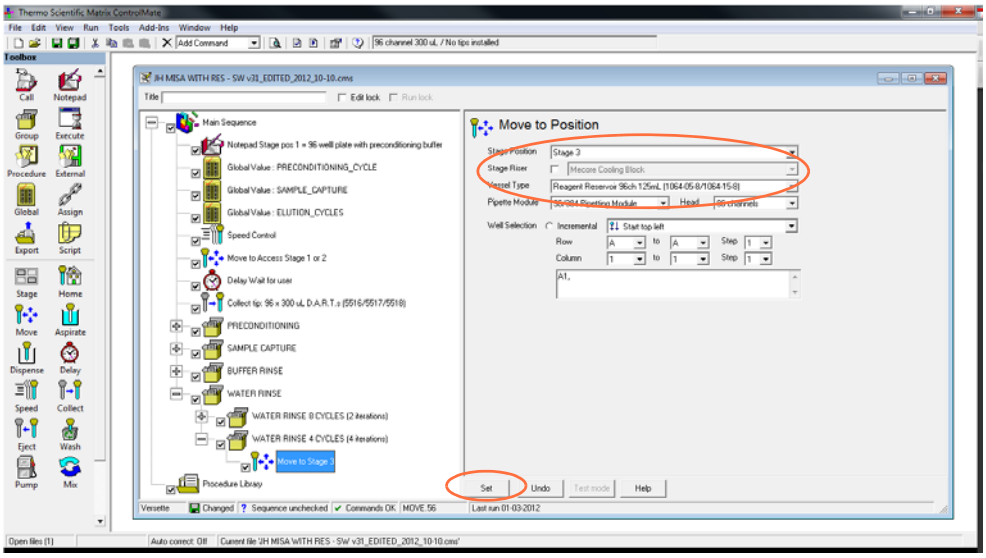


61. Click on "-" symbol next to the "WATER RINSE" group command to collapse the step.

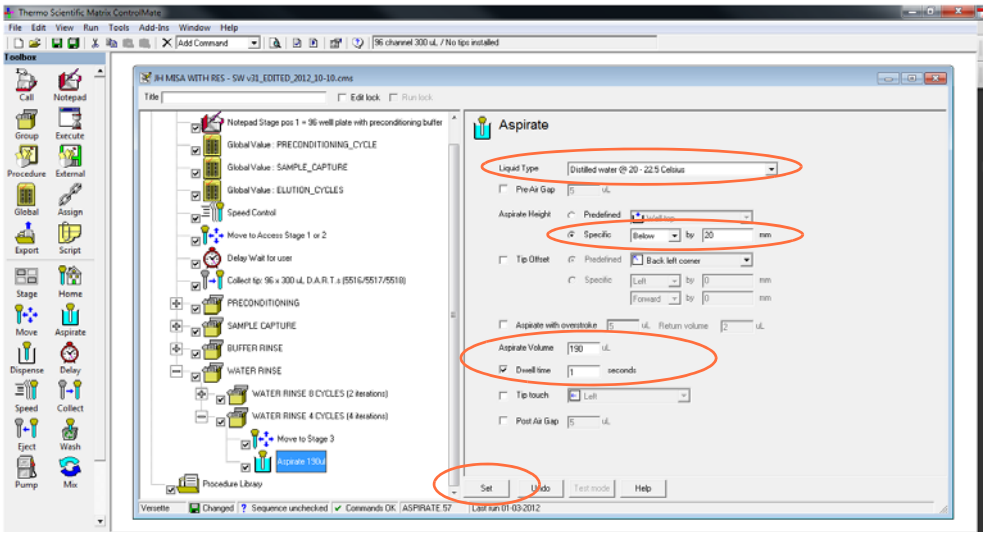
62. Click on the Group  icon then enter a Title of "WATER RINSE 4 CYCLES", select items shown, then select "Set".



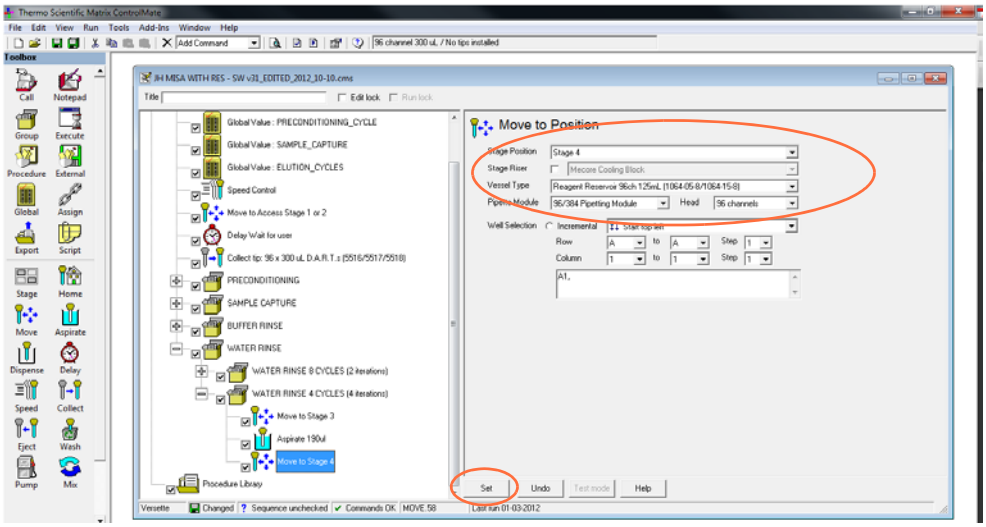
63. Click the Move  icon, select “Stage 3”, amd set screen values shown, then select "Set".



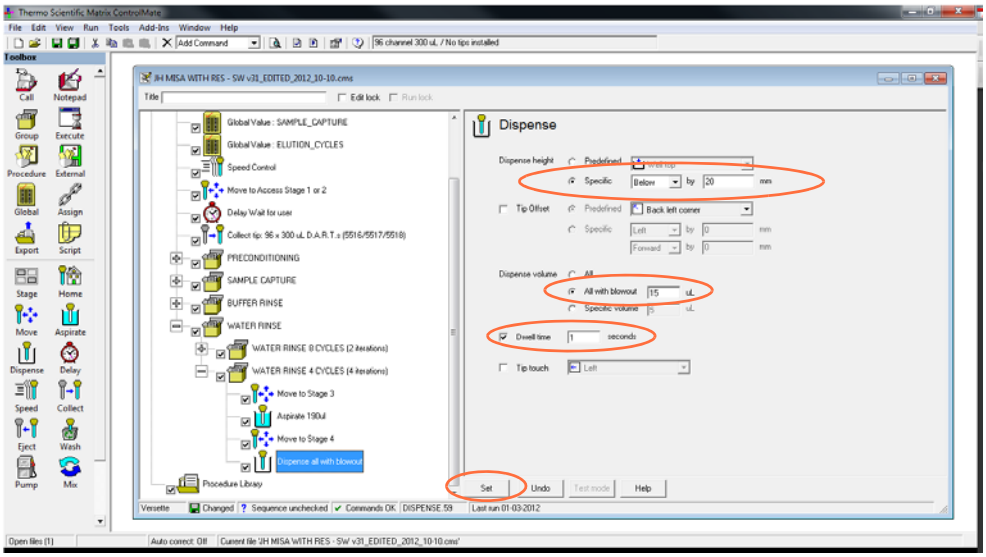
64. Click on the Aspirate  icon, select the Liquid Type, Aspirate Height (Specific, Below 20 mm), Aspirate Volume of 190 µL, and Dwell time of 1 second, then select “Set”.



65. Click on the Move  icon, select Stage 4 (see screen), enter variables as shown, then select "Set".

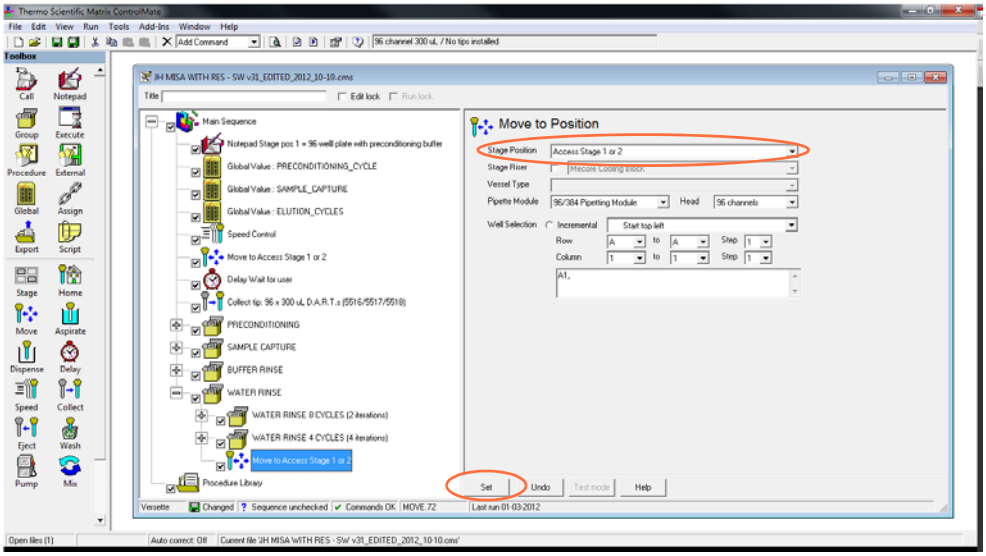


66. Click the Dispense  icon, select Dispense Height (Specific, Below 20 mm), and the Dispense volume of “All with blowout 15 µL”, a Dwell time of 1 second, then select "Set".

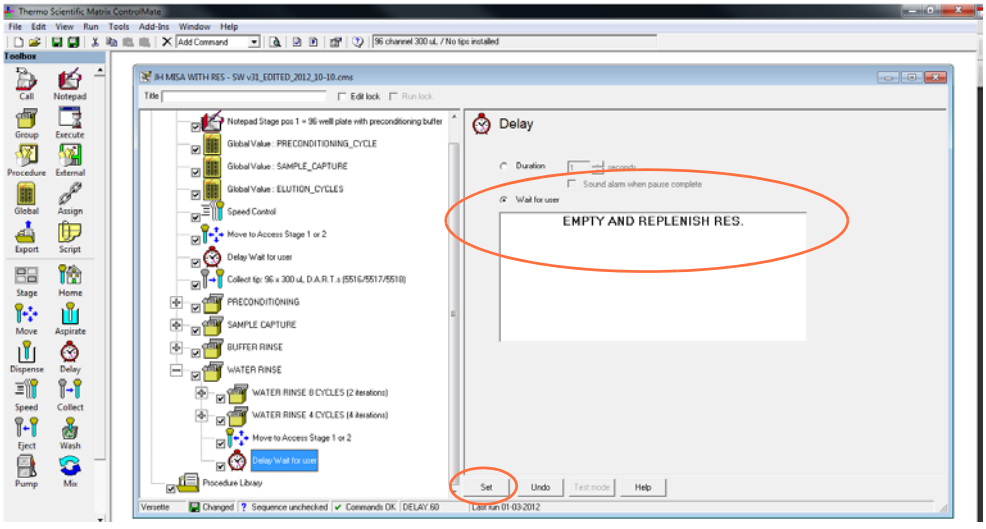


67. Click on “-” symbol next to the WATER RINSE 4 CYCLES (4 iterations) group command to collapse the step.

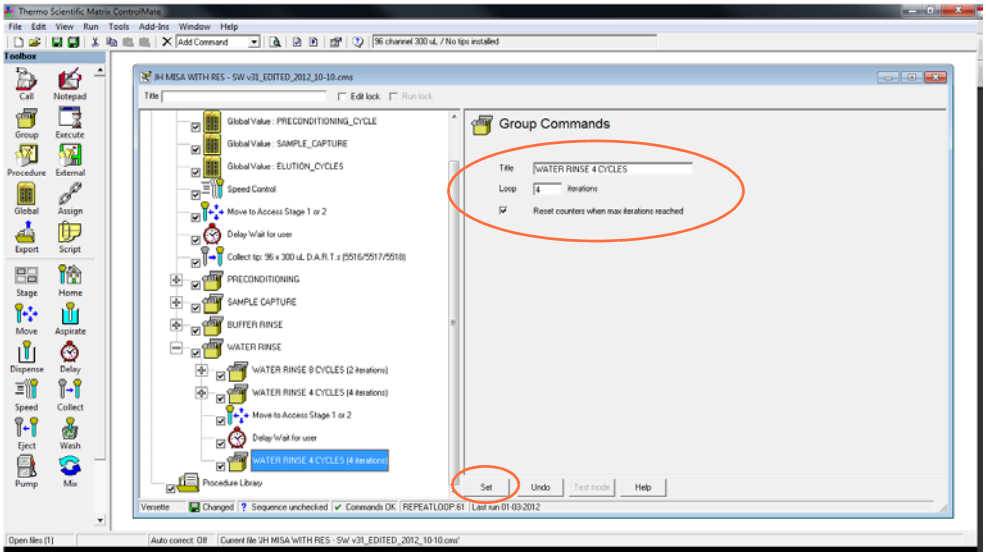
68. Click the Move  icon, select “Access Stage 1 or 2”, then select "Set".



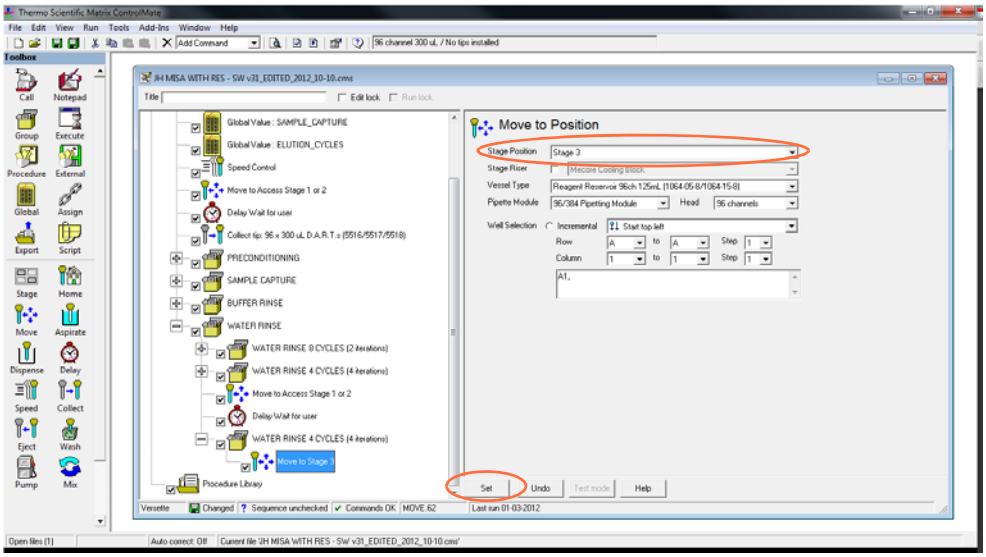
69. Click on the Delay  icon, enter a message to the user as shown, then select "Set".



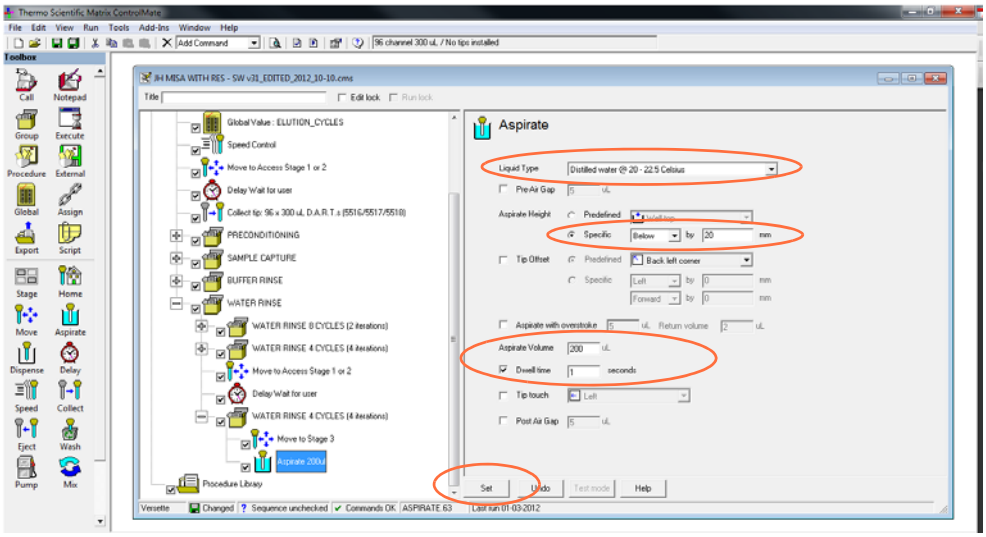
70. Click on the Group  icon then enter a Title of “WATER RINSE 4 CYCLES”, select items shown, then select "Set".



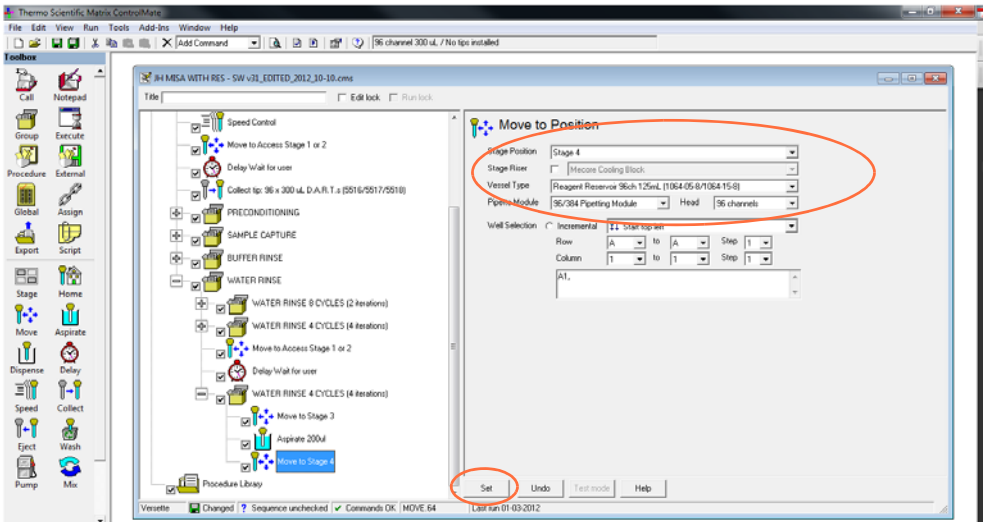
71. Click the Move  icon, select “Stage 3”, then select "Set".



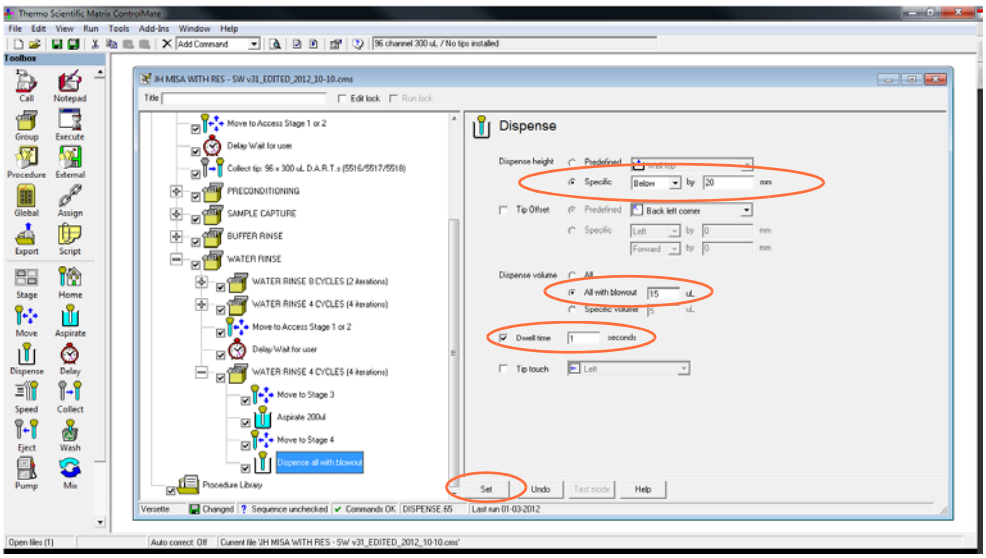
72. Click on the Aspirate  icon, select the Liquid Type, Aspirate Height (Specific, Below 20 mm), Aspirate Volume of 200 µL, and Dwell time of 1 second, then select “Set”.



73. Click on the Move  icon, select Stage 4 (see screen), enter variables as shown, then select "Set".

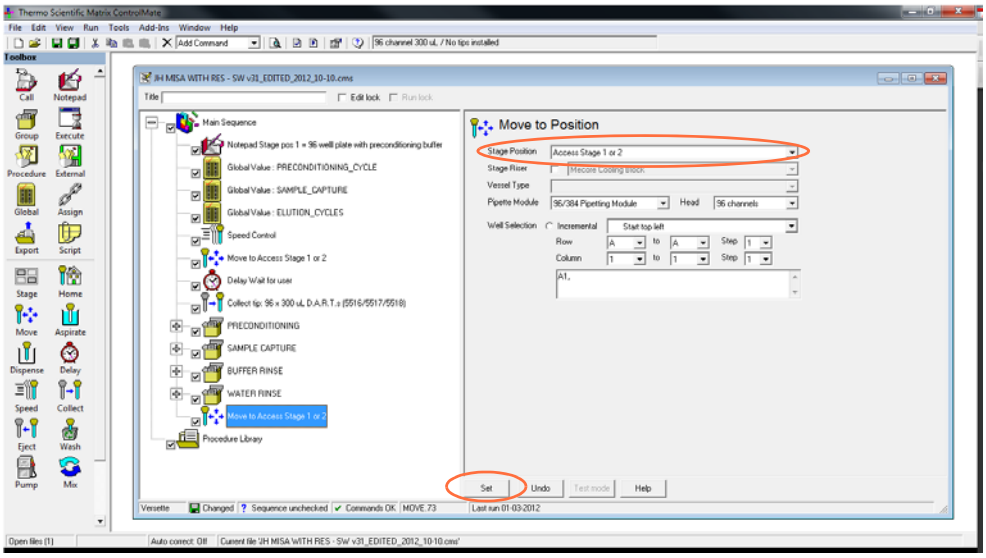


74. Click the Dispense  icon, select Dispense Height (Specific, Below 20 mm), and the Dispense volume of “All with blowout 15 µL”, a Dwell time of 1 second, then select "Set".

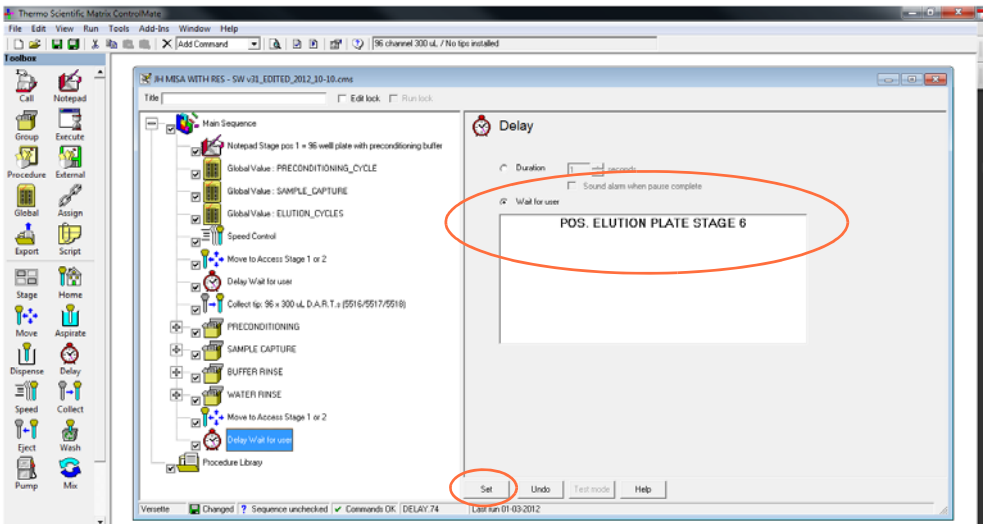


75. Click on “-” symbol next to the WATER RINSE group command to collapse the step.

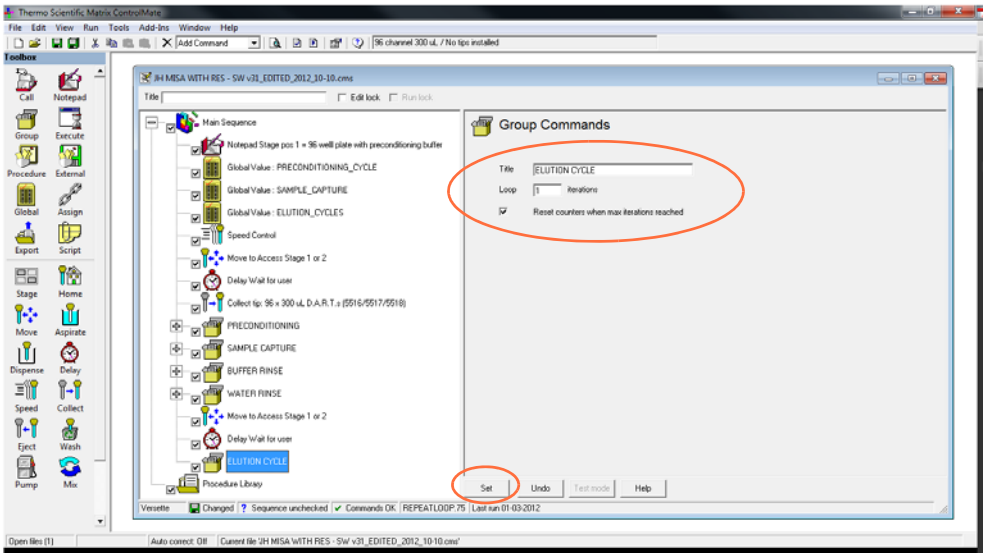
76. Click the Move  icon, select “Access Stage 1 or 2”, then select "Set".



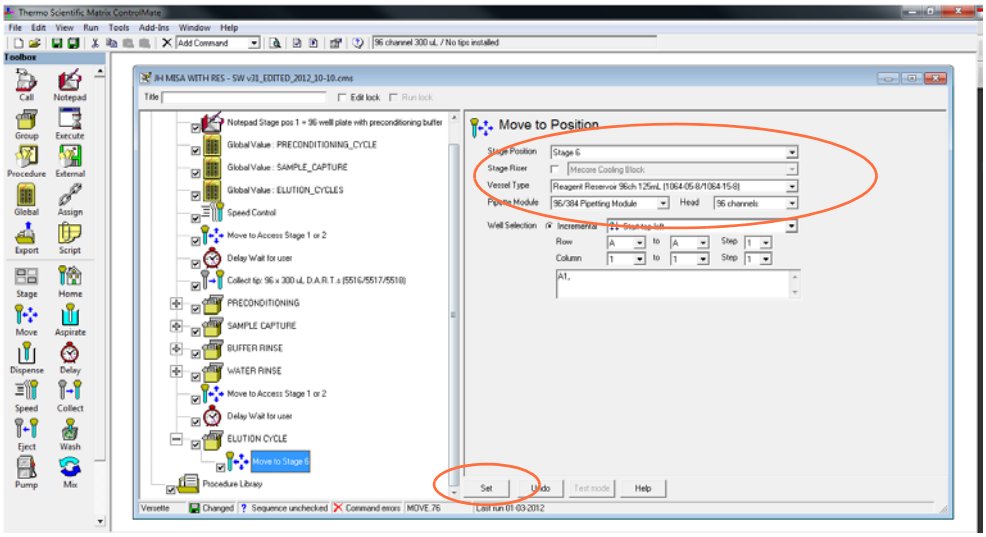
77. Click on the Delay  icon, enter a message to the user as shown, then select "Set".



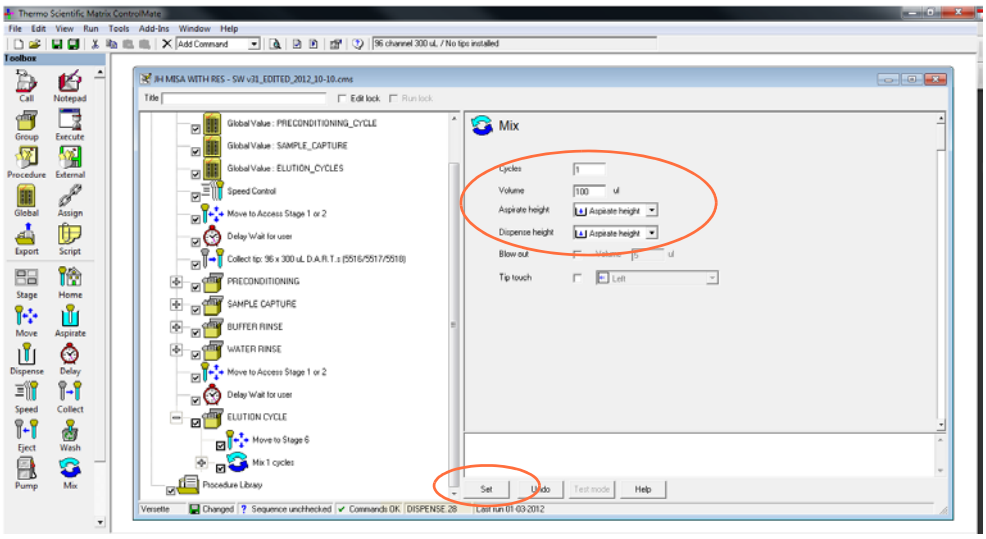
78. Click on the Group  icon then enter “ELUTION CYCLE”, select items shown, then select "Set".



79. Click on the Move  icon, select Stage 6 (see screen), enter items as shown then select "Set".

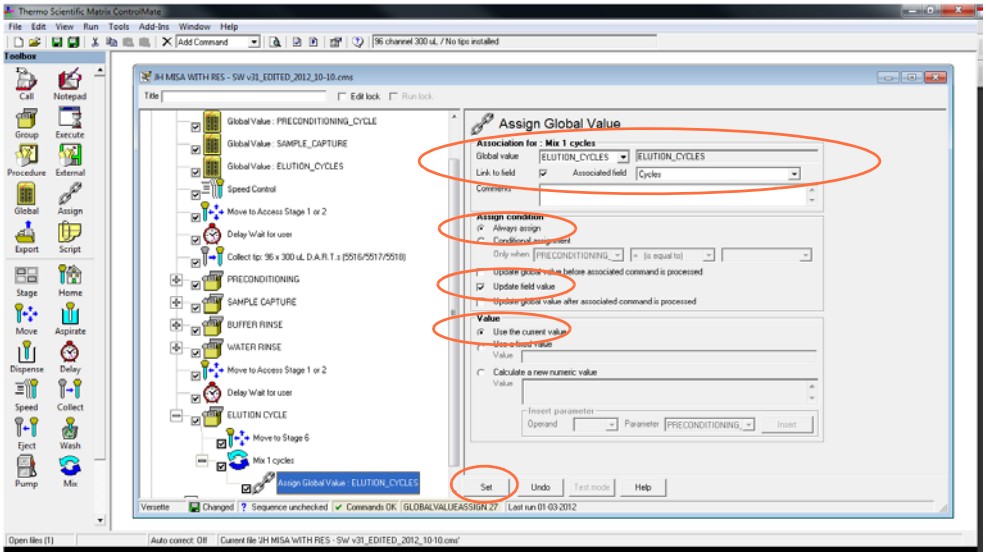


80. Click on the Mix  icon, enter a Volume of 100 µL, and set values as shown, then select "Set".



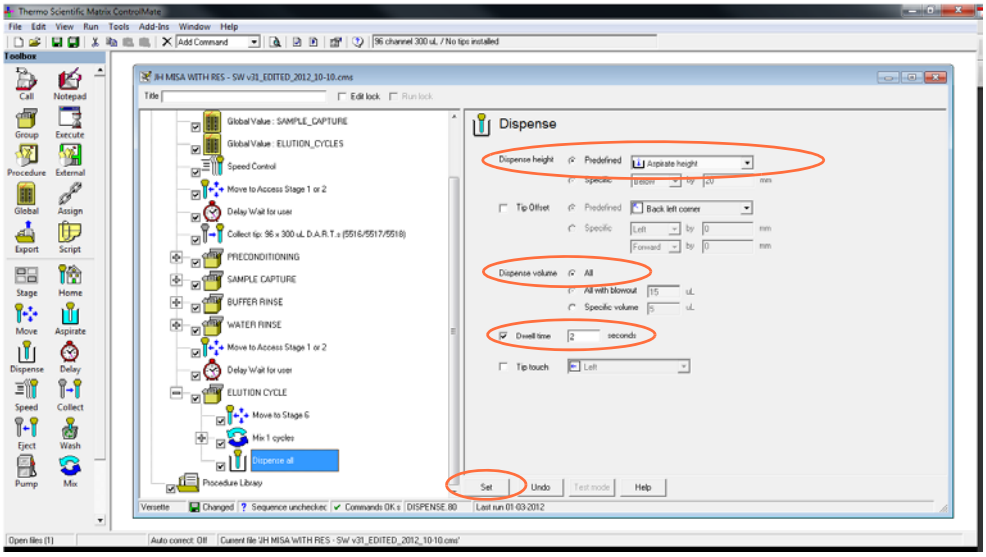
81. Click on the Assign Global Value  icon, enter variables as shown, then select "Set".

Note! This assignment of the Global Value ELUTION_CYCLE will allow the user's input at run-time to override the default number of mix cycles.



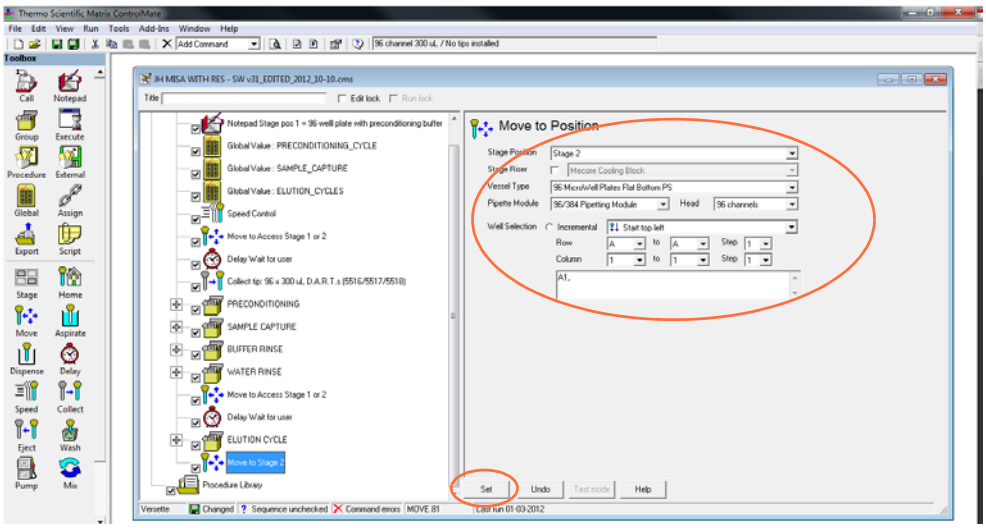
82. Click on "-" symbol next to the Mix command to collapse the step.

83. Click the Dispense  icon, select the Predefined Aspirate Height, and the Dispense volume of "All", a Dwell time of 2 seconds, then select "Set".

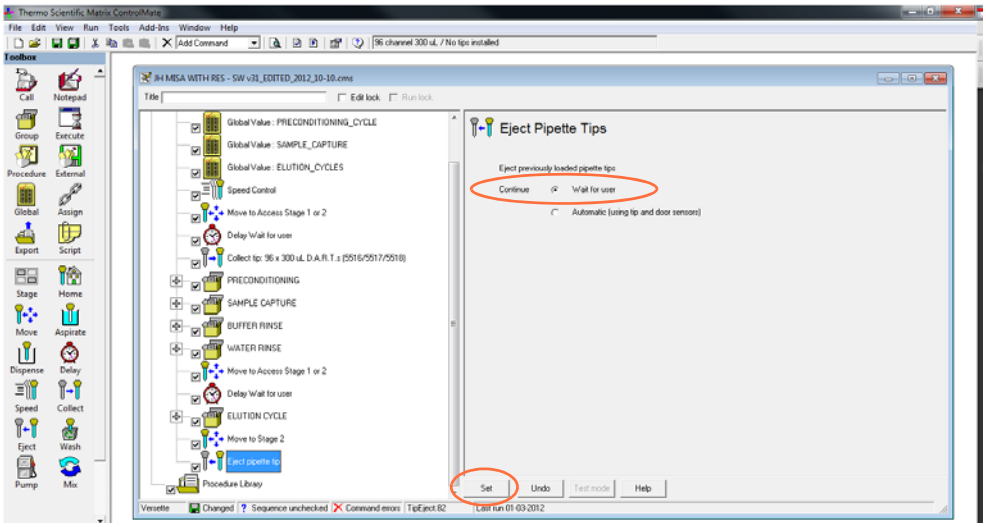


84. Click on “-” symbol next to the ELUTION CYCLE group command to collapse the step.

85. Click on the Move  icon, select Stage 2 (see screen), enter variables as shown, then select "Set".



86. Click on the Eject pipette tip  icon, select “Wait for user”, then select "Set".



Advanced Functions and Techniques

Liquid handling operations, regardless of throughput, demand precision and accuracy to minimize experimental variation. Broadly, most applications include handling chemical buffers with varying properties and/or biological macromolecules. Modifying several minor parameters in automated liquid handling procedures can result in better performance and improved downstream results. Users can choose suitable parameters for appropriate reagents and introduce features in the software to achieve better performance for their respective liquid handling procedures.

Pipetting Techniques for Small Volumes

Air gap

Air gap is a volume of air aspirated before any reagents. An air gap combined with a blowout will allow complete dispense of the liquid into the destination plate. Compare this to dispensing to a purge point using a manual pipetting technique. If an air gap is used at any point during the run, the air gap is added to the total volume available for the aspiration or dispense.

Blowout

Blowout is the command used to move the pipetting head pistons past the “zero volume” dispense point, pushing a small amount of air after the liquid is dispensed. This command in conjunction with the air gap will aid in pushing any remaining liquid in or on the outer orifice of the tip or needle into the destination labware to completely dispense the liquid. Blowout can be used to overcome capillary action to ensure the complete dispense of all fluid in a pipette.

Blowout does not affect the total volume, it is independent of the pipetting volume available.

To use the blowout command, aspirate a small volume of air before aspirating the desired quantity of liquid. Dispense as normal, then actuate the blowout to drive the aspirated air, and any remaining fluid, out of the pipette. The extra air volume should be great enough to

overcome any capillary action in the small tip orifice. The air volume should be sufficient to assist the separation of the droplet from the tip to the well bottom, but not so great that air bubbles become a problem. Air blowout is often optimized by trial and error; for example by slowing down the piston speed.

Aspiration and Dispense Speeds

The speed of aspiration and dispense will affect liquid handling results. In general, thick, viscous liquids require slower aspiration and dispense. The common occurrence of wicking (liquid adhering to the side of the tip or needle after dispense), hanging droplets (liquid not fully dispensing from the tip or needle), or full dispense of viscous liquids can be achieved by slowing the aspirate and/ or dispense speeds. Slow pipetting speeds are best for smaller volumes as they prevent droplets that form at the end of the tips from contacting the sides or top of the wells

Dwell Times

Dwell time is the amount of time the tips or needles remain in the aspirate or dispense location after moving liquid. This command allows time for pressure to equalize in all pistons and allows viscous liquids to completely aspirate or dispense. During the dispense step for a small volume it is important to use a Dwell Time to allow the volume droplet to form on the end of the pipet tip. As a general rule dwell times are dependant on the dispense volume and liquid type. Smaller dispense volumes require longer dwell times. (e.g., 0.5 – 1.0 µL dwell times should be 1.5-2.0 seconds).

Overstroke

An overstroke includes the aspiration of excess reagent and immediate dispensing of this fluid back to the source labware.

Tip Heights

Tip height and placement in the labware well is an important factor in achieving optimal automated liquid handling performance.

Tip Height for dispense should be 0.1 to 0.5 mm above the well bottom to ensure that droplets make contact with the well bottom and are removed from the tip during the dispense step. Tip height requires some trial and error to determine the optimal distance from the well bottom. A height that places the tips too deep in the wells will seal the tip to the well bottom and not allow the liquid to leave the tip. If the tips are not deep enough, the dispensed droplet will not make contact with the well bottom and will not remove the droplet from the tip.

Tip height for aspirate should be optimized from the top of the source liquid height to minimize carryover of excess fluid on the outside of the pipette to the destination plate.

Tip Touch

Tip touch is the “touch off” on the side wall or bottom of a microplate well that removes droplets adhering to the tips or needles after an aspirate or dispense. This command allows droplets to fall into the well rather than be carried away with the tips or needles.

Volume Correction

The ability to adjust pipetting head piston movements and timing for viscosity and specific gravity of solutions used in liquid handling aspirate and dispense procedures. Refer to Volumetric Calibration below.

Volumetric Calibration

The ControlMate software allows precision optimization for different liquids to improve pipetting accuracy.

Versette is factory calibrated with multiple fluid types (listed below), at specific temperatures and selected volume. Refer to the following screens and the ControlMate software to view the specific as-calibrated fluid conditions.

Please note that each calibration is for a specific fluid at a specific temperature range and a specific volume. For example, 70% Ethanol at 20°C at 150 µL.

If your system is operating with these fluids at different dispense volumes or dispense temperatures other than those for which they were calibrated, follow the instructions on the following pages to enter appropriate calibration data. Typically, an end user may have multiple calibration entries for the same fluid, depending on desired dispense accurace for a given process range. The system typically ships calibrated for the following fluids:

- Distilled water @ 20 - 22.5 Celsius
- 1% BSA @ 20 Celsius at 15 µL
- 70% Ethanol @ 20 Celsius 150 µL
- 30% Glycerol @ 20 Celsius at 30 µL
- 90% DMSO @ 20 Celsius at 5 µL

You can add modify or add new calibration values to improve pipetting accuracy of liquids.

The calibration feature defines the number of steps that the piston motor uses to raise or lower the pipetting pistons during a pipetting cycle. A liquid type with high viscosity requires more time to move through the pipet tip. By increasing or decreasing the number of motor steps, the pistons aspirate and dispense more or less liquid dependent on that liquid's characteristics (specific gravity). Liquids exhibiting higher specific gravity than water require more motor steps and liquids exhibiting lower specific gravity than that of water will require less motor steps.

Through the ControlMate software, you can define and save calibration values for a library of liquid types and liquid temperatures. These settings will be available as choices when you insert an aspirate or dispense command.

Creating a Custom Volumetric Calibration

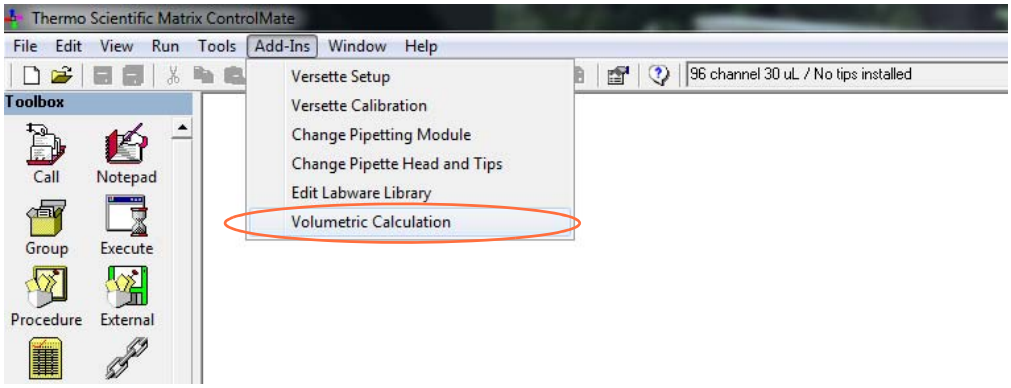
The calibration procedure is performed by obtaining five volumetric weights using ControlMate to run a dispense program. The weights, as well as the liquid's conversion factor, are entered in the ControlMate Volumetric Calculation screen. ControlMate converts the weights to volume, averages the results, and calculates the motor steps factor to control the ***Versette*** operations for the selected fluid type.

This feature is also useful to determine if you need to define calibration values for a specific liquid. After obtaining the volumetric weights, you can compare the weights to the ***Versette*** accuracy specifications. If the results are outside of the accuracy specification, then continue with the rest of the procedure to calculate the motor steps factor.

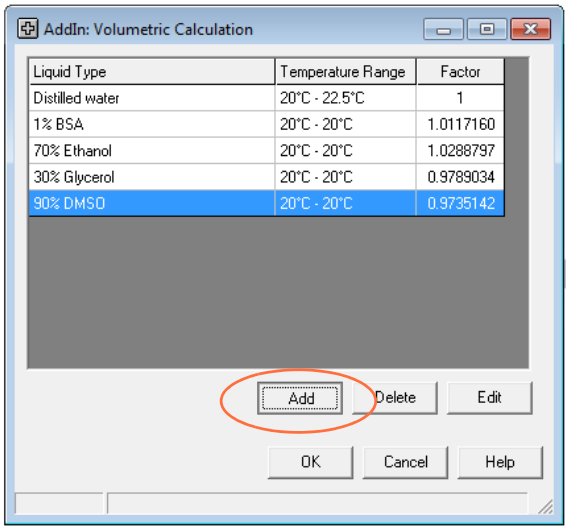
Step	Example Steps:
1. Place a reservoir of the sample (Calibration) liquid into the system.	Place reservoir on Stage 5
2. Weigh an empty 96-channel sample plate and place it in the system.	Place empty plate on Stage 6
3. Create a simple ControlMate protocol to aspirate fluid from the reservoir, move to the sample plate, and "Dispense with blowout" the calibration volume.	Aspirate 30 µL from the reservoir, move to Stage 6 and dispense all with blowout.
4. Weigh the plate with fluid, subtract out the weight of the dry plate. Divide this weight by 96 (the number of wells) to get the average weight per well. Convert this number to milligrams and record.	Sample 1: 2904 total weight of the dispense fluid, divided by 96 wells, results in an average of 30.25 mg per well

Step	Example Steps:
5. Repeat the protocol four more times and record the average weight per well.	Sample 2: 31.11458 Sample 3: 31.63542 Sample 4: 32.02083 Sample 5: 31.63542

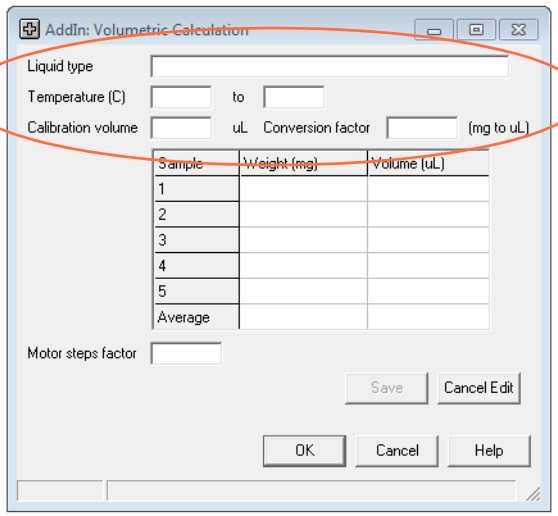
6. Select "**Add-Ins**", then "**Volumetric Calibration**".



7. Click "**Add**".

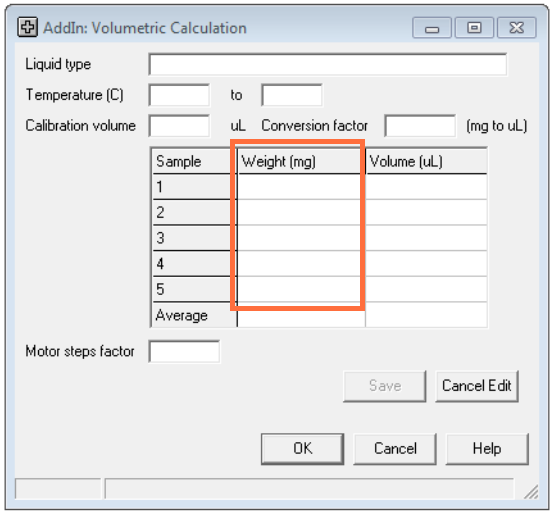


Step	Example Steps:
8. Enter the following information for the new liquid type to be added to the library: - Liquid type: enter a name for the liquid - Temperature range: valid range for the calibration, as the liquid's properties will vary with temperature changes - Calibration volume: amount of volume being dispensed - Conversion factor: density of the liquid in mg/µL (or g/cm^3)	



Step	Example Steps:

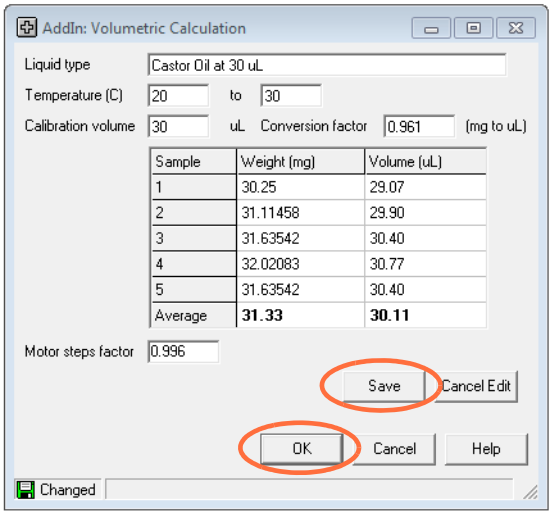
9. Enter the average weight per well of each of the 5 dispenses (recorded in steps 4 and 5 on the previous page).



10. The software automatically computes and displays the Volume of each dispense and calculates a corresponding "Motor steps factor" to control the ***Versette*** system.

    Click "**Save**" to save the new volumetric calibration, then click "**OK**" to close the screen.

    A sample screen is shown below:



Glossary

A B C D E F G H I J K L N O P Q R S T U V W X Y Z

A

Aspirate To remove / pick up fluid from a well, tube, reservoir, or other vessel via one or more pipettes.

Aspirate height (depth) The distance down into the well that the pipette tip is positioned to extract fluid from the well. This field is used to represent a pre-set height, available within the aspirate command. This height is useful for setting a default height at which liquid is aspirated.

B

Blowout Blowout is the command used to move the pipetting head pistons past the “zero volume” dispense point, pushing a small amount of air after the liquid. This command in conjunction with the air gap will aid in pushing any remaining liquid in or on the outer orifice of the tip or needle into the destination labware to completely dispense of the liquid. Blowout can be used to overcome capillary action to ensure the complete dispense of all fluid in a pipette tip. To use the blowout command, aspirate a small volume of air before aspirating the desired quantity of liquid. Dispense as normal, then actuate the blowout to drive the aspirated air, and any remaining fluid, out of the pipette tip. The extra air volume should be great enough to overcome any capillary action in the small tip orifice. The air volume should be sufficient to assist the separation of the droplet from the tip to the well bottom, but not so great that air bubbles become a problem. Air blowout is often optimized by trial and error.

C

CE Marking "Conformité Européene" = European Conformity. CE Marking on a product is a manufacturer's declaration that the product complies with the essential requirements of the relevant European health, safety and environmental protection legislations, the product may be legally placed on the market and thus the CE Marking ensures the free movement of the product within EU.

D

Decontamination Removal or neutralization of radiologic, bacteriological, chemical or other contamination.

Dispense To place fluid into a well, tube, reservoir, or other vessel via one or more pipettes.

Dispense height (depth) The distance down into the well that the pipette tip is positioned to dispense fluid into the well (or tube, reservoir, or other vessel) via pipette. This is similar to the Aspirate Depth with the exception that it is used for determining a pre-set height for dispensing liquids.

Dry tips A dry tip is simply that: a tip which has not yet been exposed to fluid. During the first aspiration into a dry tip, a very small amount of fluid will saturate the dry air in the tip with moisture, while the vapor pressure increases above the liquid inside the tip. This loss of fluid to the vapor inside the tip can affect the very small dispenses. To ensure proper

dispense, the use of a “dwell time”, an “overstroke” or implementing a “mix sequence” can compensate for any loss of fluid to the air within the tip. With an overstroke, extra fluid is drawn into the tip. With a mix sequence, fluid is aspirated then dispensed back to its source, then aspirated again. This process, with appropriate delays, will allow time for the dry air to saturate with fluid, and enable accurate dispenses with accurate fluid levels in the tips.

Dwell time The dwell time is used to specify a period of time over which to leave the tips in the sample immediately after aspirate or dispense. This allows for equalizing air pressure and liquid movement inside the tips.

L

Liquid Class See “Volumetric Calibration” **on page 267**.

M

Mix command The mix command performs an aspiration followed by a dispense, into the same source location. This can be useful to pre-treat a dry pipette tip to ensure accuracy. Refer to“Dry Tips”.

The Mix command should also be used to aspirate/dispense liquid in a vessel to re-suspend material in the vessel so that a homogenous solution can be created prior to aspiration.

N

NTC The NTC (Ninety-six - Three eighty four-Channel) pipetting module houses the 96– and 384–well pipetting heads, and the NTC teach tool.

O

Overstroke Select overstroke if this is the first aspirate prior to multiple dispenses. The overstroke sequence will aspirate additional fluid, then return a portion of this liquid to the source. This will ensure that the piston motor is primed and improves volumetric accuracy throughout all subsequent dispense allotments.

Overstroke is the process of driving the pipetting head piston during aspiration to pickup more volume that will be required for the subsequent dispense. For example, if the dispense or series of dispenses will require a total volume of 10 µl, if the piston is driven to aspirate 12 µl, the overstroke of the piston is said to aspirate an additional 2 µl. Aspirating with overstroke on the first volume aspiration is useful at lower volumes and works to ensure consistency and accuracy throughout a series of incremental dispense steps. See also Dry Tips.

P

Pipetting module A mechanism that holds pipetting heads. The NTC houses the 96 and 384 well pipetting heads, and the NTC teach tool.

Post-air gap This introduces an air gap following a aspiration to ensure that the liquid in the pipette tip does not leak during instrument movements or pauses.

Pre-air gap This introduces an air gap in the pipette before aspirating liquid. This gap above the liquid is then used during a dispense operation to push the liquid column fully and completely out of the pipette to ensure complete, accurate dispense.

S

Shape This represents the physical top shape of the well and can either be Square or Round.

Speed control The speed of the pipette pistons, as well as other system motions can be controlled to improve accuracy and precision for varying fluids. For example, the pipetting speed should be reduced when dispensing small volumes or when handling high viscosity liquids.

T

Tip touch This action causes the pipette tips to touch against a top side of a well after aspiration to remove fluid which may have adhered to the side or bottom of the tips. Tip Touch is essential for extremely low volume dispenses where accuracy is essential.

Tip/well offset Typical dispense takes place at the center of a well. Selecting a tip/well offset sets the tip position either to a corner of the well, or to a specific X and Y axis offset value. This is typically used with low volume dispenses; positioning the tips in the corner of a well provides additional surface area for the liquid to adhere.

V

Volumetric Calibration The process of calibrating the ***Versette*** system to precisely aspirate/dispense a particular fluid at a given temperature or temperature range and volume. Each system is factory calibrated for typical fluid type/viscosities. Calibration settings can be stored in memory and applied when needed. In cases where liquids with different characteristics are used, the instrument can be recalibrated in the user's laboratory for most fluids. Please note that each calibration is specific for a fluid type at a given temperature range and dispense volume. For example, 150 µL of 70% Ethanol at 20°C. Refer to the ***Versette*** *ControlMate User Manual* for details.

Viscosity Viscosity describes a fluid's internal resistance to flow and can be thought of as a measure of fluid friction. Thus, water is "thin", having a lower viscosity, while glycerol is "thick", having a higher viscosity.

W

Well count The physical number of wells contained within the vessel. The value can be one of 96 or 384. The field is used for determining positional parameters for quadrants (division of the wells into blocks) etc.

Well depth The well depth value is used to define a preset height which defines the bottom of the well. The value entered must be measured from the well to top to the well bottom at the well geometric center.

Width The well width is especially important for determining well centers and tip touching. The field value represents the physical width of the well measured at the top of the well.

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